

# POPULAR Computing WEEKLY

28 October 1982 Vol 1 No 28

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**COMPUTER SWAP**

SEE PAGE 24

**35p**

**Timex-Sinclair 1000:**  
The new micro that  
is sweeping the US

**BBC Beebstick**

**Spectrum plot  
and draw**

**ZX81 memory  
miser**

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### QUOTES

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from the ZX Software review  
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"... I previously bought your Cassette One and consider it to be good value for money!"

Richard Ross Langley,  
Managing Director,  
Mine of Information Ltd.

### CASSETTE 1

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### CASSETTE 2

Ten games in Basic for 16k ZX81

Cassette Two contains Reversi, Awaraz, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.

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### CASSETTE 3

8 programs for 16k ZX81

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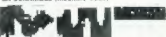
**MARTIAN CRICKET** A simple but addictive game totally unlike Earth cricket in machine code. The speed is variable, and its top speed is very fast.

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### CASSETTE 4

8 games for 16k

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#### GUNFIGHT (machine code)



#### INVADERS (machine code)



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**SPECTRUM SOFTWARE WANTED**

# POPULAR Computing WEEKLY

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### How to submit articles

Articles which are submitted for publication should not be more than 1000 words long.

All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

### Accuracy

*Popular Computing Weekly* cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

## This Week



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## Editorial

It is more than six months since the birth of *Popular Computing Weekly*. But, in that brief space of time, the microcomputer market has already changed out of all recognition.

The Spectrum, which arrived in April, astounded micro users with its colour, sound and 16K Ram for the ridiculously low price of £125. But it was soon followed by a range of similar micros such as the Dragon 32, Commodore 64, Colour Genie and the Lynx. The amazing has become almost commonplace.

In response to the changing nature of the market, *Popular Computing Weekly* is getting bigger. From November 4 we shall have 32 pages each week.

This means we shall have even more programs, more news and more coverage of the minority machines. And all for the tremendously low price of 35p.

Starting next week, we shall have a Dragon page in each issue. Those Dragon owners who have been starved of software can relax at last.

Spectrum, Vic, BBC and ZX81 owners will also find their needs are catered for each week.

*Popular Computing Weekly* is going to be bigger and better than ever. Order your copy now, before the rush starts.

## Next Week

Can you change the course of history? Find out in Guy Fawkes — a new game for 16K Spectrum.

Other features in next week's issue include a round-up of ZX81 educational software. Tony Bridge reviews the latest educational packages from ICL, Sci-Soft and others, and concludes that they could do better.

Also next week, Malcolm Davison explains how to draw bar-charts to illustrate your programs.

**SPECTRUM COMES TO LIFE !**

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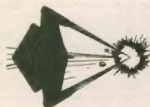
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Sord M5 with 8K Rom, 4K Ram and 16K video Ram.

## Sord in the home

SORD Computer Systems will launch its new home microcomputer in the UK by the end of November.

Called the Sord M5, it is based around the Z80A processor with 8K Rom, 4K Ram and 16K video Ram. Targeted mainly for the games market, the M5 accepts a range of plug-in Rom cartridges which provide games, languages (Basic or Pips) and utilities. Two games' paddles are supplied as standard.

Video output to an ordinary tv set is in one of four modes: (a) 40 × 24 character, black and white; (b) 32 × 24 character, 15 colours; (c) 64 × 48 pixel, dot programmable in 15 colours; and (d) 256 × 192 pixel, only two of 15 colours in any 8 × 8 pixel (one character) area.

Up to 32 graphics shapes or 'sprites' can be defined giving the M5 powerful animation capabilities.

Three individually prog-

rammable voices provide the tv sound output, making musical and special games effects possible.

The Sord M5 measures 10½ × 7¼ × 1½ inches and has a moving keyboard. Apart from the Rom cartridge port it has a cassette input/output, monitor video output and parallel printer output. Launched at the beginning of October in Japan there is already a library of 60 games and utilities available for the M5. Priced at around £110 in Japan, the UK price is expected to be in the region of £150.

Sord Computer Systems, founded in 1970, is Japan's fastest growing company. Sales doubled in 1981, and turn-over in 1982 is estimated at £40m. The company opened a UK office on October 1 as a prelude to launching its range of microcomputers in this country. Apart from the M5, Sord offers a range of 8- and 16-bit business systems.

## Nascom's got enhanced Basic

LUCAS Logic has produced a colour board and an enhanced Basic package for its Nascom range of microcomputers.

The Advanced Video Controller (AVC) colour board gives the Nascoms high-resolution colour graphics in three formats: a 392 × 256 mode with eight colours, a 784 × 256 mode with two colours and a combination of both modes. The AVC, which is supplied complete with a special high-resolution graphics software package, costs £185 plus VAT.

An enhanced Basic is also available on cassette for 16K Nascoms 1, 2 and 3. Enhanced Basic provides the machines with more than 75 new commands and functions including *Call*, *Open*, *Close*, *Chain*, *Create*, *Pop* and *Hex*. It can also cope with up to 255 files.

Lucas's Peter Horion explained that the enhanced Basic is supplied complete with an exhaustive manual which gives details of the machine-code hooks present on which you can hang your own routines. "It gives you all the information you need to write your own Basic commands for the machine" he said. The Nascom Enhanced Basic costs £40 plus VAT.

## Hunt Inquiry report brings Cable tv nearer

CABLE television could be in operation within three years if the Government implements the recommendations of the Hunt Inquiry report, published on October 12.

The main feature of the proposed guidelines of the three-man committee, headed by Lord Hunt, is the lack of restrictions. The report endorses a cable tv system with no restriction on advertising time, no vetting of material carried and no restriction on the levels of charges to customers.

Setting up a nationwide cable network would serve three main purposes, according to the report: to relay BBC, ITV, Channel 4 and radio broadcasts, to provide "some interactive services of benefit to business and the consumer", and to provide a large range of tv programmes of local or minority interest.

Benefit for the microcomputer user will come from the second of these three. A multi-channel cable network could give easy access to every kind of information and allow routine communications between people, computers, groups of people and groups of

computers. The way is open to set up local area computer networking systems and armchair buying/selling facilities.

The extent to which cable tv will be able to fulfil these goals will depend on the precise nature of the cables used. A system using conventional coaxial cables could support about 30 channels. One based on new fibre-optics cable technology would be more flexible and have many more channels. Which type of cables will be used has yet to be decided. A Department of Industry committee has been set up to advise on this question but has still to announce its findings.

## Brands Hatch computer fair

SOUTH East Computers and Commodore Business Machines have combined forces to stage the South East Pet Show.

The computer fair will be held at the Kentagon, Brands Hatch from November 15-17. For more details contact Nick Manning, Haydon Manning Ltd (Tel: 0342 28358).

## Free Prestel adaptors get go-ahead

PROJECT Y, the Prestel plan to give away 100,000 adaptors, has been approved by the Board of British Telecom.

Under the scheme, customers of an as yet unnamed financial institution — believed to be a national building society — will be given free adaptors to allow their television sets to receive Prestel information.

The purpose of the package deal is to encourage more people to use British Telecom's viewdata service. At present only some 20,000 customers can access the system's 250,000 pages.

Project Y is the result of a government-backed conference held in February. If the final go-ahead is given by the mystery institution, the scheme could be in full swing by January next year. It is hoped to install about 2,000 adaptors a month. Each will incorporate a full alphanumeric keyboard to allow full use of the system.

The plan will run in parallel with the Micronet 800 scheme for computer users. But, where Micronet members will be able to access Prestel pages, Prestel users will not be able to call up Micronet pages.



Free Prestel adaptor.

## Beelines flight terminated

BEE LINES, the Bolton-based suppliers of the Beebox Vic20 expansion unit, has collapsed.

The company called in the receiver at the beginning of October. Beelines' difficulties were apparently brought on by the failure of one of its sub-contractors to supply parts vital for the Beebox unit.

The collapse does not effect Beelines' associated company, B & B Computers, which will continue trading.



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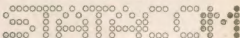
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# Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

## Mary Goodman, Mary Goodman

Thank you for publishing my letter ("Some have many faults" August 12). Almost immediately I had a letter from Sinclair's Customer Relations department in the name of "Mary Goodman" asking for a description of my problems. When I supplied this, I was asked to return the latest Ram pack to this lady at Cambridge who then refunded my £49.95.

I have had to write off the cost of "n" letters and return postages etc, but I can now afford a Ram pack and a keyboard from another manufacturer.

Your readers may be interested in the Customer Relations address. It is Mary Goodman, Customer Relations, Sinclair Research Ltd, 6 Rings Parade, Cambridge CB2 1SN.

G D Pearce  
5 Orchard Lea  
Coxley Wick  
Wells  
Somerset

## In at the deep end

I am most surprised to have twice seen incomplete and downright wrong information in what purports to be an authoritative, technical information service.

I refer to issues August 19 and September 9 where Ian Beardsmore in Peek & poke states that you cannot poke characters on to the ZX81 screen display.

In fact, this can easily be done on a 16K machine with an expanded display file, by addressing relative to the system variable D File.

The expression `Peek 16396 + 256 + Peek 16397` creates D File, the address of the first Newline character (decimal 118) of the display file. `Poking D File + 1` with the appropriate character code fills character space (0,0) in line 0, column 0; `D File + 2` fills (0,1) and so on, up to `D File + 32` for (0,31). Never `Poke D File + 33` as this contains the next Newline character. Location (1,0) then should be `Poked at D File + 34`; (1,1) at `D File + 35`, etc.

Thus one can easily calcu-

late parameters to `Poke` any screen location, always remembering that D File+ any multiple of 33 is to be avoided. Further, as D File varies merely with program length, it can be assigned to a variable to avoid constant use of the expression quoted previously. Try the following:

```
10 LET D = PEEK 16396 + 256 +  
   PEEK 16397  
20 INPUT N  
30 POKE D + N, 128  
40 GOTO 20
```

More depth to your replies in future please.

Il Sullivan  
12 Aston Road  
Earlsdon  
Coventry  
West Midlands

## Perfect partners

Although, like Mr P Webb (Letters, August 19) my BBC micro was ordered last December, it was very cool and delivered in perfect condition.

I suspect that Mr Webb was unlucky enough to receive one of the last machines to be made before the changeover to the current switch-mode power supply. This seems to have totally eliminated any problems arising from overheating.

My own experience with the BBC micro is entirely favourable.

J D Robinson  
3 The Jinnings  
Welwyn Garden City

## Backdoor achievements

You may be interested to hear what I consider to be a very clever 'backdoor' achievement by Sinclair. This is a redesigned circuit board for their Spectrum computer which has rendered me the 'NOT SO PROUD' owner of a DK'tronics 32K Ram module that will not fit the Spectrum.

About five weeks ago, I received my 16K Spectrum and noted the requirements for their upgrade to 48K, whereby one had to part (after waiting 12 weeks for delivery) with the unit and £50. Having noted the DK'tronics advertisement for their 32K Ram upgrade, and realised the simplicity of fitting it in your own

home for just £39.95, I jumped at the chance and ordered one.

The module was fitted and worked well, until a week later, when my Spectrum failed. The Ram upgrade was removed and the Spectrum returned to Sinclair. Posted on August 31, I received a brand new 16K Spectrum on September 14 (only two weeks' wait, wow) only to find, horror of horrors, this model had a changed circuit board design which does not allow the simple "Plug-in facility" of all Sinclair's competitors' add-on Ram packs.

I think this matter should be brought to light immediately to avoid a lot of people experiencing this problem. I leave the matter with you and hope that my letter to DK'tronics is received with sympathy.

Michael Wilson  
Flat 1  
77 Roxborough Road  
Harrow  
Middlesex

## Looping the loop with Spectrum

In response to Ian Logan's request for "bugs" why not try the following on your Spectrum?

```
10 FOR F = 65536 TO -65549 STEP  
   -1  
20 PRINT F  
30 NEXT F
```

This is a very interesting feature and it helps to explain the observation that `Int -65536` gives -1 on the Spectrum. (For some reason the Spectrum appears to be calculating `Int -1 × 1038` which is indeed -1.)

By changing line 10 (see below) it can be seen that the effect is observed only when F attempts to step to exactly -65536. It fails to do this and instead yields `-1 × 1038`.

```
10 FOR F = -65290 TO -66090  
   STEP -256  
11 POKE 23692, -1 (REM  
   AUTO-SCROLL)  
12 PAUSE 10  
13 MB 65200 = (65536 - 256)
```

It is of interest that having looped from `-1 × 1038` through to -65536 the loop stops at the "correct" value. The explanation of this would appear to be the way in which numbers are stored by the Spectrum.

Integer numbers in the range ± 65535 are stored differently from floating point

numbers and numbers outside this range — see Spectrum handbook. Thus the loop prints -65536 on the second time around but it is really `-(65536 + 1 × 1038)`, i.e. non-integer format.

A number of other apparent "bugs" can also be discovered once this "magic number" has been discovered but I will leave them for you to discover since they are only variations on a theme.

PS Would someone please tell me if this bug also exists on the ZX81.

M Mulhern  
Dept of Metallurgy  
Surrey University  
Guildford

## Plus que ça change ...

Has anyone looked inside a recent Spectrum? If so, you will find that the printed circuit board has been redesigned and the "piggy-back" method of memory increase has been eliminated. The additional 32K memory is now plugged into empty sockets on the main board.

However, something is still amiss with the ULA. Two of its legs are bent up and wires run from them to another chip that has been up-ended and stuck to the pcb with double-sided adhesive tape. From this chip (Nandgate?) further wires run to other parts of the pcb. This whole assembly is then further covered by a piece of black insulating tape.

Of five Spectrums I know personally, two no longer work and one gives poor colour. Having seen letters regarding the Spectrum in computer magazines already, I can only say "Here we go again, Uncle Clive".

I do not have a Spectrum on order and am now considering other alternative machines.

D Mitchell  
24 Arretton Close  
Knighton  
Leicester

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.

## COVER STORY

# Hallowe'en

A new game for BBC  
model B by Jeremy Ruston

It is Hallowe'en, and you are driving down a lonely road in the heart of Dorset. The rain beats across your face through the shattered windscreen and the lightning crashes across the sky, interfering with your Sony Walkman. Suddenly, Bessy, your faithful Mini Metro, gives a disturbing hiccup and grinds to a sickening stop. The dashboard lights flicker for a few terrifying moments, before they are extinguished.

With a frightened start you realise that you are alone at 11.34 pm on Hallowe'en. Terror grips you. Your eyes grow accustomed to the frighteningly dark night, the rainstorm stops, but behind you snowdrifts are now piling up with alarming speed. Darkness has turned to bright light. You realise that the only course open to you is to trek across the open countryside.

A long time later you find yourself on the brow of a hill and realise the snowdrifts have engulfed Bessy. A haunted house stands in front of you, surrounded by a forbidding looking forest.

Your only chance of survival is to enter the house and find a telephone. But, watch out for the ghosts.

Now we will leave our brave traveller. The object of the game is to navigate your way through the house to the telephone. However, three ghosts are at large in the house, and they will try to stop you.

The house takes the form of several interconnected corridors. You have to travel from one side of the house to the other, but your choice of direction is limited by the position of the doors in the corridors.

A plan of the house is presented on the left-hand side of the screen. Your own position is marked in blue and that of the ghosts in white.

Two thirds of the screen is taken up with a three dimensional view of the corridor you are in. There is a time limit of one minute on the game. Elapsed time is displayed as a red column under the plan of the house.

The controls are Z for left and X for right, L to go forwards and J to jump randomly to another part of the house. The jump facility may only be used once per game. You cannot go backwards.

The movement keys only work if there is a door in the appropriate place, ie you can only move forwards if there is a door in front of you. The game ends when the time is up, the ghosts have got you, or you reach the telephone.

NB: The game was written for a disc based model B BBC computer, which only gives 5.75K under mode 2. Thus the game has had to be heavily compressed. If you find the game too fast, alter the value of Del in line 60.







## LET YOUR SPECTRUM EARN ITS KEEP

Now available for the 16K and 48K  
Spectrum — SPECTRACALC

This remarkable spreadsheet program is an invaluable tool not only in its traditional role in financial planning but also in countless other business, home, scientific, engineering and technical applications.

Some of the features that make SPECTRACALC rather special are: formulae may use any of the Sinclair functions (not just +, -, x, &) including brackets and logical operators, can mix absolute and relative co-ordinates and be any length; simple repeat procedure; line and column insert and delete; choice of format between 3, 5, 8 & 9 digit columns; no need to enter zeros; fast calculation and formula position display. Above all it is easy to learn and convenient to use once learned.

For cassette and booklet send cheque or postal order for £12.95 (COMPUTACALC ZX for ZX81 is still available for £7.95) to

Silicon Tricks  
2-4 Chichester Rents  
Chancery Lane  
London WC2A 1EG

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## STAR DREAMS

### 48K SPECTRUM SOFTWARE

**STARTREK.** Save the galaxy from the Klingons. Full Tordiel 8 x 8 galaxy, Warpdrive, short and long range scan, status reports, galactic map, shields, phasers, torpedoes and more.

**TOWER OF BRAHMA.** Can you solve the ancient Hindu puzzle?

Both programmes on cassette £5.95. As reviewed in *Popular Computing Weekly* 21 October issue.

**DUNGEON.** Make your way through a labyrinth of passages, searching for fabulous treasures, fighting the many denizens of the underworld.

**ASTROSPY.** Search the alien ship for the secret weapon, watch out for the security robots and try to escape to earth. Can you survive the Astronag affair?

Both programs on cassette £5.95.

**COMPUMAT.** Compumat is a powerful program for the setting up and resolution of a matrix or grid of interdependent calculations. Based on the popular Visicalc program, Compumat is ideal for financial planning and engineering applications. Features include user defined grid size, auto/manual duplication of formulae, also row/column totals. Data may be saved on cassette and may also make use of ZX printer.

Cassette with full instructions £8.95.

9 BAINBRIDGE CLOSE  
SEAFORD, EAST SUSSEX  
Tel: 0323892157

## C.P.S. GAMES

### ADVENTURES

#### HASHA THE THIEF

Try to enter the Potale and steal the golden leopard of the Dala Lama. There are not only traps and pitfalls but even some magic trying to stop you from getting to the private room.

#### THE WIZARD OF SHAM

If you can reach his head, then he will give you the star of life. Travel through the jungle, the ghost land of Sham and find the secret entrance to the temple in which the wizard lives. Once in the temple you will need all your skills and determination to avoid the dangers awaiting you. You may meet the wizard in the end, but we doubt it...

#### THE FOURTH KIND

Can you manage to communicate with the extra-terrestrials and obtain from them the universal medicine for eternal life? This is not only an adventure but will test also your skills in trying to overcome what would seem to be impossible communication problems.

#### THE 7 CITIES OF CIBOLA

These famous cities, where the Spanish Jesuites found their gold, are situated somewhere in the South-American jungle. Their whereabouts have been lost for several centuries, and nobody has found them ever since. Can you survive in this exhausting climate and find at least some treasure? And, if you find it, will you still be strong enough to get back with your gold? There is not only the climate, indians, poisonous animals, secret religious tricks and many more.

#### THE DOMED CITY

You are travelling through uncharted territory and your way is blocked by a giant ant heap. By a freak mutation these ants are as big as you and there is only one way open: through the ant's lair. Some ants are friendly, others are aggressive, and your weapons are not much help: your survival depends on skill, anticipation and cunning. Will you succeed?

#### THE TOWER OF BRASHT

One member of your expedition has been taken prisoner by the Khans, a cruel tribe living near the edge of civilisation. You must choose a few companions from your team, and try to get the prisoner out. Success or failure will depend on whom you choose and how they are equipped. This D&D type adventure is a difficult and will take you some time to play. It can be used as a roleplaying adventure, with as many players as there can be members of the team.

#### THE GHOST OF RADUN

In the old, half ruined castle of Radun, a large treasure is buried. Many have tried to find it, but none have ever returned to tell the tale. It is rumoured that the treasure is guarded by a ghost, who appears when least expected, and makes sure that the treasure hunter can no longer return. This adventure is definitely not for the weak-hearted and we strongly advise not to play it after nightfall, especially not when you are alone in the house.

#### ADVENTURES FOR THE VERY YOUNG:

There is no longer any need for very young children to gaze wearily at a computer they are not allowed to touch. This new series of adventures is mainly based on graphics, but follows the traditional pattern of an adventure game. There are some elementary instructions for which a bit of help from the grown ups may be needed. If you want to see some little eyes light up...

#### PETER RABBIT AND THE MAGIC CARROT

Peter Rabbit goes on a quest for the magic carrot. It is rumoured that any rabbit taking one bit of that carrot gets an extra twenty years of life. Peter has to go through the big forest, meets nice (and not so nice) friends, deals with a dwarf, gets help from old man oak, etc...

Will he get to the cave and find the magic carrot?

#### PETER RABBIT AND FATHER WILLOW

Father Willow has been damaged by vandals, and is now in a bit of a state. Peter Rabbit goes in pursuit of the vandals. They know and try not only to escape but to stop Peter Rabbit from following them. Luckily the latter gets help from the other trees, who heard about the story. But will he find the vandals and have them locked up?

#### PETER RABBIT AND THE NAUGHTY OWL

Jimmy the Owl has been unfeatherable of late. The Council of the Meadlands sends Peter Rabbit on an expedition to find the Master of the Owls, in order to have Jimmy taught some manners. The Master lives very far away and to take an adventure getting there. Will Peter Rabbit come back without having seen the Master and thus Jimmy remain a hunchling?

It now transpires that the Peter Rabbit Adventures can be dangerously addictive to grown ups...

#### TUMMY DIGS

Complementing the Peter Rabbit series, a new series on Tummy Digs, a little dwarf. As with the Peter Rabbit games, the adventures are very easy (basically a maze) with graphics and it is up to the kids to invent the story themselves, after an introduction has been given.

#### TUMMY DIGS GOES SHOPPING

Make a shopping list, walk out of the forest and shop in town. You must find the shops, pay for your purchases and make sure that you can carry it all. Also, don't run out of money...

#### TUMMY DIGS GOES WALKING IN THE FOREST

Have a pleasant but adventurous walk in the forest. Meet some animals and plants, have a chat, and make sure you are home in time for bath and dinner.

#### WAR GAMES

All with full graphics (if the battle field, and inclusive of manual).

#### KING ARTHUR

Britain in the sixth century... THE ANGLES and SAXONS are massing through the Country, leaving behind a trail of blood and devastation. In the South a man is gathering troops and fighting them off. His name is Arthur. You take his role in this fascinating war game. Will you be able to win all the battles he won and free Britain from the plundering marauders? How good are you at commanding troops, finding the enemy and bring him to battle, sifting information, seeing through the fog of war, deploying your troops and many more similar tasks?

#### BATTLE OF THE BULGE

Admission: 1844. The famous "von Rundstedt" offensive.

#### BATTLE OF THE RIVER PLATE

A simulation of this well known sea battle.

#### CONVOY

You are the commodore of a convoy under attack from submarines. Instant decisions are required and if you hesitate too long the damage may be severe. Try to outwit the enemy and destroy him. Not easy... Again graphics, but combined with verbal explanation.

All these games are available for ATARI 16K and SPECTRUM 16K

Some of the games will load different programs successively and are thus much larger than 16K.

All C.P.S. Games, except those for children, are priced at £9.50. The Peter Rabbit and Tummy Digs games are now £4.50.

C.P.S. 14 Britton St., London EC1M 5NQ (01-251 3090)



## New Year sees in Prestel-linked Micronet 800 database

**David Kelly talks to Bob Denton — the man behind Micronet 800.**

Two months after Bob Denton and Richard Hease got together to set up Prism Micro-products, the company seems set to tie up a sizeable slice of the micro market.

Prism has been appointed the sole UK wholesaler of the Sinclair range of products. It will shortly be expanding to sell non-Sinclair ZX81 software and hardware, and soon software for other machines.

On January 1, 1983, Prism launches Micronet 800 (*Popular Computing Weekly*, September 23), an ambitious new Prestel-linked database. Micronet will, for the cost of a local telephone call, bring news, reviews and hundreds of computer programs within easy reach of your micro-computer.

The microchip first announced itself to Bob in 1972 when he worked for a cash register manufacturing company. The traumatic effect the microprocessor has had on that industry convinced him that there was something important.

Bob Denton changed industries to become marketing manager for Texas Instruments, supervising the launch of the TI99/4. After that, he helped launch Mattel Intellivision, tried to save the ailing Tandata Prestel operation and most recently was Dragon's director of Sales and Marketing during the launch of the successful Dragon 32 machine.

In February this year he set up an electronics magazine, on Prestel, called *Electronics Insight* the magazine was never available as hard copy — only as pages which could be viewed on Prestel.

Then Bob met Richard Hease — Chairman of ECG and EMAP Publications. They realised that, although coming from different directions, they both wanted to set up a Prestel software network.

In June, EMAP's Prestel division, Telemap, bought up *Electronic Insight*. These two systems, now under the control of Prism, are being expanded and enhanced and will form the basis of Micronet 800.

Ownership of Prism is split between Richard Hease, its chairman, and Bob, its managing director. They reckon to expand the Telemap system from its current 3,000 Prestel pages up to the Micronet system

which it is hoped will have 30,000 pages when it is launched in the new year. ■ mid-1983 the system will be gatewayed on to a GEC 4082 main-frame to provide a database of up to 150,000 pages.

Bob Denton is confident that Micronet can attract over 100,000 members in the first three years of its operation. Telemap gets 60,000 accesses to its pages each month from the 18,000 Prestel users which puts it into the top 20 information providers on Prestel. To get the hoped for number of subscribers Micronet is going to have to provide top quality information and software easily and at low cost.

"At first, all we wanted to be was the catalyst in the setting up of a system like Micronet", says Bob. "In the event we ended up doing it ourselves. Micronet will do most of the things that satellite tv will do — teleshopping, armchair banking, electronic mail — at a fraction of the cost. There are now over 200,000 micros in use in the UK. Connection to Micronet by phone, using a small adaptor, will bring your computer to life!"



Micronet 800's Bob Denton

Micronet will cost £1 a week ■ members with a joining fee of around £50. For your money Micronet gives you access to the current Prestel network, news and comment, an educational software library and hundreds of programs ■ download, listed according to machine. But, Prestel subscribers will not be able to call up Micronet pages.

The cost of the system is raised from the quarterly membership fee and from advertising space sold on the pages. Much of the information and many of the programs held will be available free of charge. Authors' royalties will be levied, where

applicable, and billed quarterly.

Most of the national and regional user groups will have bulletin boards for club news. ■ will also be possible to purchase both hardware and software using the system — the order is keyed in together with the purchaser's name, address and credit card number.

"The major problem", says Bob, "has been adaptors to connect the micro to the phone. We are going to manufacture adaptors compatible with every micro that has a population greater than 25,000." Provision of the Micronet adaptor is included in the joining fee.

Prism has developed three basic general-purpose hardware adaptors that will connect to a micro via an RS232 interface. A basic modem, an acoustic modem and an intelligent unit (including an auto-dial facility).

Each of the major micro manufacturers has been approached by Prism. The following is a list of machines and the expected month by which ■ Micronet adaptor should be available. ZX81 (March), Spectrum (March), Apple (Jan), BBC (Jan), TRS-80 (March), Commodore 3000, 4000 and 8000 (Jan), Commodore 64, 500 and 700 (March), Research Machines 380Z (Jan), Dragon-32 (June).

Adaptors are being manufactured, available in the first quarter of 1983 for Sinus, ICL, Rare, IBM, Superbrain and Dec machines. Adaptors for Sharp, Nascom, Texas Instruments, NewBrain, Atari, Lynx and Osborne are yet to be finalised.

Prism plans to manufacture 100,000 adaptors, 20,000 in the first year. Bob hopes that the supply of adaptors will be ■ short term activity for Prism. "As Micronet takes off, more and more machines — like the Torch — will supply their own built-in adaptors."

It will cost the Micronet consortium — Prestel, EMAP, ECC and Prism — about £3m to get the scheme off the ground, and a further £1.5m per year to keep it running. "We are probably not going to make a big profit ■ year one," said Bob. "What we have to do is to make it as painless as possible to join and to provide ■ wide range of services."

As Micronet expands so will Prism's conventional retailing outlets. After seven weeks' trading, the company is selling over 350 ZX81s a day. "Our privileged position with Sinclair to some extent will make Prism the arbiter of which add-ons and software are and are not bought."

"Soon Prism will be selling software for other micros. Our sales force will be marketing computer cassettes like the music business — there may even be a top 10 chart," says Bob. "In a way the two parts of Prism — telesoftware and conventional retailing — conflict. But we will be able to use Micronet as a software testing ground. We will know how often each game on Micronet is accessed. The most popular game will then be pushed ■ the retail outlets as 'Cassette of the Month'."

"Prism", enthused Bob, "has both ends of the market and intends to become very much a force to be reckoned with."

The neater layout of the circuit board.

# Reviews

## Collaboration gives birth to a doubled memory

Jeff Naylor looks at the Timex-Sinclair 1000 and compares it with the ZX81.

hardware

When a company in the automobile industry launches a new car that is essentially the same as another car, it is known as badge engineering.

The Timex-Sinclair 1000, which costs \$89.95 and was launched in the US last month, certainly has a different badge from the ZX81. But it also boasts twice as much memory.

Timex, who assemble the ZX81 and Spectrum at its plant at Dundee for Sinclair, has emerged as the Timex Computer Corporation's first micro, built under licence from Sinclair, is only for sale in the US. It will not be sold in the UK.

The first difference to note after the badge is some of the keyboard routing. There are no extra functions, but *Rubout* and *Nowline* are replaced by *Delete* and *Enter*. Presumably these words are thought to be more common to computer-aware Americans.

All those other ZX81 features are there, however — the membrane keyboard, the black case, the fragile jack sockets and the unplated edge connector. Sorry to go on about the badge, but I also noticed the raised letters ZX81 are missing. Does this mean Timex has produced its own mould for the case or has the original been altered?

Turning over the Timex 1000 reveals a small switch marked "CH2-CH3". How many devices can you plug into your television? Would it not be nice if the vid99 cassette, VU game, Teletext tuner and computer(s) did not all appear on channel 36? With all the extra TV stations in America add to the problem, a channel select switch is more of a necessity than a luxury. The final external difference I could spot was some white lettering referring to FCC rules and radio interference, and those dreaded words "NO USER SERVICEABLE PARTS INSIDE".

When the case comes apart the first difference from the ZX81 is a layer of metal coating on the inside of the plastic moulding, earthed via two springy metal strips protruding from the circuit board. My immediate thought was that this might improve saving and loading by reducing the interference which can occur with certain juxtapositions of TV, cassette and computer. This was not the case, however, as I soon managed to position the equipment so as to render my most reliable tape unloadable. The Americans are touchy about radio interference and this neat

method of screening is probably required to pass the Federal Communications Committee regulations which are referred to on the underside of the machine.

Using a portable VHF radio I checked the Timex for pollution of the airwaves. It was almost silent in comparison with my own Sinclair ZX81.



Bird's eye view of Timex 1000.

The Timex 1000 circuit board is marked "Issue 3" and "ZX81". The layout is neater than earlier boards, but with the exception of the Ram and a few extra components, the pcb is identical to a ZX81. If you have built a Sinclair III you will already be aware that some additional parts convert any ZX81 to American (or French) TV standards, although the modulator must be of a different type.

More interference suppression is provided on the 9-volt input (two coils and a capacitor) and the ear and mic sockets (capacitors). The only major physical difference between the two machines is a large 2K static Ram chip soldered firmly into the same area that is normally occupied with the ZX81's 1K chip.

What about the Ram? I loaded its contents into an array and then checked it off against a new ZX81 Ram (the one without the bug). This is the sort of boring task that computers are very good at, leaving us humans free for more rewarding tasks such as doing the washing up. When we both had finished, the ZX81 confirmed an exact match between the Roms.

The next problem was to get the Timex up and running. Without an American television, I needed to use a different modulator. So I hooked up a screened lead from a point on the Timex board marked UK2 and took it to the input of my own Sinclair modulator, suitably disconnected from its host computer. Applying

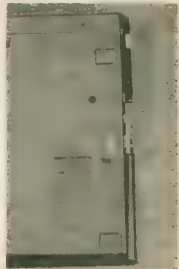
power to this batch-up produced the familiar cursor, but the television was struggling to lock on to only 525 lines.

A study of the manual reveals a system variable called *Margin*, containing the number of blank lines generated. This is loaded with either 55 or 31 lines each time a TV frame is output. The keyboard scanning routine also detects if a resistor called R30 is pulling pin 20 of the ULA down to earth.

The practical upshot of this is, if R30 is in place, the computer produces 525-line pictures. Remove the resistor and you have a 625-line machine! Thus, anyone who acquired a Timex 1000 could use a monitor. A discarded black and white video game might provide a cheap UK modulator to turn it into a 2K ZX81.

So, what difference does the extra memory make? In fact, as the operating system uses upwards of 160 bytes just to work, the Timex 1000 has more than twice as much space as a ZX81.

When Sinclair introduced his low-priced machine, the cost of memory was very high. So the ZX81 Ram goes to great lengths to actually make a 1K computer work, notably by setting a minimal display file if there is less than 3 1/4 bytes available. A full screen (768 bytes) leaves no room



Underneath the Timex 1000.

for a program of any size in a 1K machine. The first advantage of a 2K machine is that simple programs can use the whole screen. But, if you wish to write a longer listing, extra room can be borrowed by keeping screen displays to the absolute minimum.

There is no denying the sense of achievement in squeezing a crash-proof program into a limited space, but the tricks needed to do this in 1K lead to quirky, inelegant programs which are difficult to understand. The Timex 1000 will be a better learning machine, and I believe that "lack of memory" frustration will be reached much later. Many Timex owners will never buy a Ram pack, but move to another computer when they need to expand.

## Magic from the little blackbox

**Beebstick** Micrex, 54 Linley Road, Alsager, Stoke-on-Trent, Staffordshire, Tel: Alsager 77270.

Price £29.95 inc VAT and packaging.

The Beebstick comes in a strong cardboard box, well packed with polystyrene for protection. It also has a cassette with various demonstration programs suitable for a model A machine, fitted with an analogue to digital converter, or a model B.

The instructions on the Beebstick's use are very simple. First, plug in the joystick to the shaped, multi-pin socket at the back. Then read the instructions on how to adjust your programs to accommodate the Beebstick by using the BBC Basic variables *Adval0* to *Adval2*. *Adval0* returns a 2 the fire button has been pressed, *Adval1* returns a value between 0 and 65535 for the horizontal value and *Adval2* the same for the vertical value.

The range of numbers returned by the Beebstick are so great that they need to be scaled down to allow the user to move

Any serious data storage is still out of the question, but software possibilities, especially machine code games, are greatly enhanced. Many commercial prospects must exist with the size of the American market. For example, a game such as Artic's *Galaxians* occupies little over 3½K, and includes a very elaborate title page. A slimmed down version could perhaps be fitted into 2K, especially as it uses less than the full screen. A full feature invader game should easily fit into 2K if alternate screen lines are used.

The ZX81 has already found a place in the American computer market. The Timex 1000 should, if pricing and marketing are right, take over to great effect as a cheap consumable for Americans who are curious about computers.

position and the fire button on the top left hand corner is in easy reach. The black box is 6 x 3 x 2 inches. The ribbon cable provided is a generous two feet six inches and consists of a 15-way ribbon cable with D type plug on the end.

### Conclusion

This one of the reviews I enjoyed doing as the device is so simple to understand and use. It is robust, useful, and reasonably priced. Micrex would like to hear of its use for handicapped people. SA

## ZX81 Graphics Rom

### 4K Graphics Rom

Kayde Electronic Systems Ltd, The Conge, Great Yarmouth, Norfolk, Tel: 0493-55253.

### ZX81

Price: £29.95 inc VAT.

The Kayde 4K graphics Rom gives the ZX81 a choice of eight different character sets, selectable by *Usr* calls. Kayde has also taken the sensible course of issuing software to take advantage of the board.

Fitting the Rom is not simple. You must unplug the Rom from the Sinclair main board, plug it into the graphics board and solder four wires to the main pcb. Not a job for the beginner, but someone at your local user club would probably do it for you. The instructions are faultless.

Once installed, a *Rand Usr X* will select one of the character sets. Character set number 1 is the standard Sinclair set, number 2 contains various faces and musical symbols (but no numbers or letters) while number 3 contains some Pacman symbols, digits and the playing card symbols. Number 4 gives you upper and lower case letters and punctuation symbols, but no digits, number 5 gives you an assortment of graphic symbols, letters and digits and number 6 contains more Pacman symbols and letters and digits. Number 7 gives you all the asterisks characters and digits and finally number 8 gives you digits and an assortment of games symbols.

Only one of the sets can be on the screen at the same time, giving a funny

## Improving Spectrum

### Abacus Controller

Abacus Electronics, 166 St Helen's Avenue, Swansea, West Glamorgan.

### Spectrum

Price £14.95

When the Spectrum was first announced, many people speculated on the possible add-ons that would be offered for it, given that the bottom had fallen out of the market for keyboards/add on Rams and high resolution graphics. Of the Spectrum hardware items I have reviewed, this one most impressed me and is the only one I shall always use.

There are two serious design faults with the Spectrum. One is the need to unplug the cassette plug not being used — which is ludicrous on a machine of this calibre — and the other is the silent beeper. This simple device solves both those problems, and makes the Spectrum a much nicer machine in the process.

The Abacus Controller is fitted with one socket, one switch and five flying leads. To use it, you unplug the power socket from the back of the Spectrum and push it into a similar socket on the Controller. Sinclair's cassette leads can be discarded, as two Controller leads go into the Spectrum's cassette sockets, while another two connect to similar sockets on the cassette recorder. Once the power lead from the Controller is plugged into the Spectrum, you are ready for business.

The Controller has a three position rotary switch, labelled *Load*, *Save* and *Amp*. The switch is set to the first two positions when *Loading* and *Saving*. The *Amp* position is used when an amplifier is required for the *Beeper*.

The volume control for the beeper is accessed with a small screwdriver through a hole in the case — a serious inconvenience.

The device also amplifies the cassette signals, so you have to adjust the volume levels on your cassette recorder.

### Summary

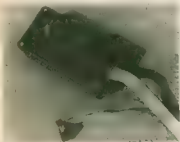
All Spectrum owners should seriously consider buying an Abacus Controller, or an equivalent, but only when Abacus has been lobbied to supply longer leads. JR

appearance to program listings! I was sorry I see that none of the sets made any use of the *Plot* statement — it would have been nice if the *Plot* command would give some sort of recognisable result.

Also available is Kayde's version of *Pacman*, *Peckman* (£5.95) which takes advantage of the facilities of the graphics Rom. It was a pity I reviewed Acornsoft's *Pacman* for the BBC Computer on the same day, but Kayde's version is still excellent, given the limitations of the ZX81 even with the graphics Rom. I can't wait to see Kayde's version for the Spectrum.

### Summary

These two products improve the ZX81 beyond all recognition for games playing. If that is your forte, you should give serious thought to both products. JR



Beebstick

from one dot to another. But, this is clearly explained in the instructions.

The demonstration programs on the accompanying cassette are simple, but show the usefulness of the Beebstick. The *Sketch* program is my favourite as I was able to amaze my six-year-old by drawing her name on the screen in normal handwriting.

The Beebstick itself is very easy to use. It is very similar to those joysticks used for controlling model planes.

The stick is spring loaded into the middle



# Open Forum

Open Forum is for you to publish your programs and ideas.  
It is important that your programs are bug free before you send them in. We cannot test all of them.  
Contributions should be sent to: Popular Computing Weekly, Hobhouse Court,  
19 Whitcomb Street, London WC2H 7HF.

## How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.  
(The usual fee is £5.)

### Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

## Cypher

### on ZX81

This program is a computerised version of an extremely secure cypher system used by a 16th Century French cryptographer, Blaise de Vigenère, while travelling widely in Europe on diplomatic service.

Unlike a monoalphabetic substitution cypher, in which each letter of the message is always represented by the same letter — for example, "a" equals "F", "g" equals "I", etc. — in a Vigenère cypher each letter is represented by a letter which is dependent on a keyword known only to the originator of the message and the addressee.

This keyword determines which column of Vigenère's table (see Fig. 1) will be used when transposing the letters of the message, and thereby provides an extremely secure means of passing a message to a

friend, or of keeping records secret from inquisitive snoopers.

Program notes (Fig. 2)

40 to 130 set up the Vigenère table.  
140 to 250 accept the message to be enciphered or deciphered.  
260 to 310 determine whether to encipher or decipher.  
320 to 430 constitute the encipher routine.  
440 to 560 constitute the decipher routine.

To use the program

```

ABCEDEFGHIJKLMNOPQRSTUVWXYZ
BCDEFGHIJKLMNOPQRSTUVWXYZA
CDEFGHIJKLMNOPQRSTUVWXYZAB
DEFGHIJKLMNOPQRSTUVWXYZABC
EFGHIJKLMNOPQRSTUVWXYZABCD
FGHIJKLMNOPQRSTUVWXYZABCDE
GHIJKLMNOPQRSTUVWXYZABCDEF
HIJKLMNOPQRSTUVWXYZABCDEFG
IJKLMNOPQRSTUVWXYZABCDEFGH
JKLMNOPQRSTUVWXYZABCDEFGH
KLMNOPQRSTUVWXYZABCDEFGHI
LMNOPQRSTUVWXYZABCDEFGHIJ
MNOPQRSTUVWXYZABCDEFGHIJK
NOPQRSTUVWXYZABCDEFGHIJKL
OPQRSTUVWXYZABCDEFGHIJKLM
PQRSTUVWXYZABCDEFGHIJKLMN
QRSTUVWXYZABCDEFGHIJKLMNO
RSTUVWXYZABCDEFGHIJKLMNO
STUVWXYZABCDEFGHIJKLMNO
TUVWXYZABCDEFGHIJKLMNO
UVWXYZABCDEFGHIJKLMNO
VWXYZABCDEFGHIJKLMNO
WXYZABCDEFGHIJKLMNO
XYZABCDEFGHIJKLMNO
YZABCDEFGHIJKLMNO
ZABCDEFGHIJKLMNO

```

Fig. 1 De Vigenère Table

```

10 GEN POLYALPHABETIC SUBSTITUTION CYPER
20 REN AUTHOR = A.C. CROX
30 REN CREATE SUBSTITUTION TABLE
40 PRINT
50 GOTO 120
60 FOR I=1 TO 26
70 LET J=J+1
80 FOR K=1 TO 26
90 LET A(I,K)=CHR(65+J+K)
100 LET A(I,27)=CHR(65+J)
110 IF I=1 THEN 20 THEN LET A(I,K)=CHR(65+J+K)
120 NEXT K
130 NEXT I
140 REN START MESSAGE ROUTINE
150 PRINT
160 PRINT
170 PRINT
180 INPUT "ENTER KEYWORD: "
190 PRINT
200 PRINT
210 PRINT
220 PRINT
230 INPUT "ENTER MESSAGE: "
240 PRINT
250 PRINT
260 INPUT "ENCIPHER (E), DECIPHER (D) OR QUIT (Q): "
270 PRINT
280 IF Q THEN GOTO 120
290 IF E THEN GOTO 320
300 IF D THEN GOTO 440
310 IF Q THEN GOTO 120
320 REN ENCIPHER ROUTINE
330 LET C=1
340 WHILE C<=LEN M
350 PRINT "ENCIPHER MESSAGE: "
360 PRINT
370 LET T=0
380 LET T=0
390 LET T=0
400 IF T=LEN K THEN LET T=1
410 LET T=1
420 IF T=LEN K THEN LET T=1
430 GOTO 340
440 REN DECIPHER ROUTINE
450 PRINT
460 LET C=1
470 WHILE C<=LEN M
480 PRINT "DECIPHER MESSAGE: "
490 PRINT
500 LET T=1
510 IF T=LEN K THEN LET T=1
520 LET T=2+1

```

- (1) You and your correspondent agree on a keyword or phrase, for example: NOWISTHETIME (Note... No spaces or punctuation marks).
- (2) Feed in the program.
- (3) Follow the instructions in the program.
- (4) Copy the result of the encipherment or decipherment.

Examples of messages are shown in Figs 3 & 4.

```

510 IF ZILEN K THEN LET Z=Z+LEN K
520 FOR K=1 TO 26
530 IF A(Z,K)=M THEN LET C=CHR(65+J+K)
540 NEXT K
550 NEXT Z
560 NEXT M
570 GOTO 140

```

Fig. 2 Polyalphabetic Substitution Cypher Program

```

ENTER KEYWORD
NOWISTHETIME
ENTER MESSAGE
HAVEFUNDOTHEGOLDERRINGPICKANDSHOVELSJOE
ENCIPHER/DECIPHER/ENTER E OR D
ENCIPHER MESSAGE READS -
JORNKHURST ITCHLTPKRXUGKQVUULS
JXUUGH

```

Fig. 3 Encipherment

```

ENTER KEYWORD
NOWISTHETIME
ENTER MESSAGE
JORNKHURST ITCHLTPKRXUGKQVUULS
JXUUGH
DECIPHER/DECIPHER/ENTER E OR D
DECIPHER MESSAGE READS -
HAVEFUNDOTHEGOLDERRINGPICKANDSHOVELSJOE
ENTER KEYWORD

```

Fig. 4 Decipherment

Cypher  
by Alan Croy

## 3D Graphics

### on ZX81

Until a three dimensional system is available true 3D plotting is impossible. By using the principles involved in simple geometry, however, movement in three dimensions can be simulated. The functions involved are scaling, perspective and rotation, all of which can be carried out using some very simple equations and functions such as Sin and Cos.

The example program given at the end of the article is written for a ZX81. It may be used on any computer with *Flor* or some other equivalent statement such as

# Open Forum

Set. A number of variables are used in the program which will need special alteration for other machines, they are:  
MX and MY: the maximum x- and y-coordinates  
CX and CY: the centre about which the shapes are plotted. For convenience these are set to the middle of the screen, at  $\frac{1}{2}MX$  and  $\frac{1}{2}MY$ .

$X(n)$ ,  $Y(n)$  and  $Z(n)$ : the X, Y and Z coordinates of the point. Only the X and Y coordinates are plotted; the Z is used to calculate perspective.

Plot works with two parameters, X and Y. These allow two dimensions. The Z axis can be imagined as being at right angles to the other axes, coming directly out from the centre of the screen. A positive Z coordinate denotes a position in front of the tv; a negative Z is behind the picture. The greater the Z coordinate the closer the image will appear to be.

Most computers have the zero points on the axes at a corner of the screen, which is not very convenient for functions. Therefore a false centre must be set up, usually in the centre of the image. In the illustration program CX and CY denote the artificial centre. To account for this a point X, Y, where X and Y are relative to CX and CY would be plotted as:

PLOT CX+X, CY+Y

When a point is plotted in the program the array coordinates are not used in the Plot statement; X and Y are used instead:  $X(i)$ ,  $Y(i)$  and  $Z(i)$  are used to calculate the final position. If a number of complex shapes must be moved around, it is simpler to have a separate centre for each shape.

This is the process which determines whether a point lies within the legal limits for the Plot statement. A point is illegal if, with CX and CY added, the point is greater than the MX and MY limits or less than zero. Plotting outside these limits will normally cause an error.

The Z coordinate is used as an offset to calculate for perspective. If  $Z(i)$  is positive then the point is further away from the centre than if Z would be zero. F is used to multiply a point to calculate the offset. I used 2 if Z was positive, 0.5 if it was negative or 1 if it was zero. You should change this according to taste.

If the entire shape is to be moved by a certain amount without the relationship of individual points being changed, then it is simpler to alter the centre about which the shape is plotted, if rotation, stretching or shearing is needed then the following simple mathematical functions should be used.

Rotation.

If a shape needs rotating about any axis by N degrees or radians, depending on your computer, the following functions need to be used.

Rotation about the X axis.

$X = X \cdot \cos(N) - Y \cdot \sin(N)$

$Y = Y \cdot \cos(N) + X \cdot \sin(N)$

Z = Z

Rotation about the X axis

$Y = Y \cdot \cos(N) - Z \cdot \sin(N)$

$Z = Z \cdot \cos(N) + Y \cdot \sin(N)$

X = X

Rotation about the Y axis

$X = X \cdot \cos(N) - Z \cdot \sin(N)$

$Z = Z \cdot \cos(N) + X \cdot \sin(N)$

Y = Y

Objects may be stretched in any direc-

tion by increasing the X, Y or Z coordinates by any amount.

Shearing involves adding the Y coordinate to the X or Z coordinate and stretching by 45°.

```

10 REM 3D DEMO, A.ESMOND 27.9.8
11 REM TO SAVE SPACE ONLY THE
POINT'S ARE PLOTTED, THEY ARE NOT
JOINED
20 REM Z&X&Y SEQUENCE
30 LET MX=63
40 LET MY=43
50 LET CX=MX/2
60 LET CY=MY/2
70 FOR I=1 TO 10
80 DTH I(0)
90 DTH I(1)
100 LET MA8
110 LET MA11=0
120 LET X(1)=4
130 LET Y(1)=4
140 LET Z(1)=4
150 LET X(2)=4
160 LET Y(2)=4
170 LET X(3)=4
180 LET Y(3)=4
190 LET Z(3)=4
200 LET X(4)=4
210 LET Y(4)=4
220 LET Z(4)=4
230 LET X(5)=4
240 LET Y(5)=4
250 LET Z(5)=4
260 LET X(6)=4
270 LET Y(6)=4
280 LET Z(6)=4
290 LET X(7)=4
300 LET Y(7)=4
310 LET Z(7)=4
320 LET X(8)=4
330 LET Y(8)=4
340 LET Z(8)=4
350 LET X(9)=4
360 LET Y(9)=4
370 LET Z(9)=4
380 LET X(10)=4
390 LET Y(10)=4
400 LET Z(10)=4
410 REM PLOT FRONT VIEW
420 FOR I=1 TO 10
430 LET X=X(1)+CX
440 LET Y=Y(1)+CY
450 LET Z=Z(1)+F
460 LET X=X(2)+CX
470 LET Y=Y(2)+CY
480 LET Z=Z(2)+F
490 LET X=X(3)+CX
500 LET Y=Y(3)+CY
510 LET Z=Z(3)+F
520 LET X=X(4)+CX
530 LET Y=Y(4)+CY
540 LET Z=Z(4)+F
550 LET X=X(5)+CX
560 LET Y=Y(5)+CY
570 LET Z=Z(5)+F
580 LET X=X(6)+CX
590 LET Y=Y(6)+CY
600 LET Z=Z(6)+F
610 LET X=X(7)+CX
620 LET Y=Y(7)+CY
630 LET Z=Z(7)+F
640 LET X=X(8)+CX
650 LET Y=Y(8)+CY
660 LET Z=Z(8)+F
670 LET X=X(9)+CX
680 LET Y=Y(9)+CY
690 LET Z=Z(9)+F
700 LET X=X(10)+CX
710 LET Y=Y(10)+CY
720 LET Z=Z(10)+F
730 REM CLIP
740 IF X<0 THEN GOTO 1000
750 IF X>MX THEN GOTO 1000
760 IF Y<0 THEN GOTO 1000
770 IF Y>MY THEN GOTO 1000
780 IF Z<0 THEN GOTO 1000
790 IF Z>F THEN GOTO 1000
800 LET X=X/4
810 LET Y=Y/4
820 LET Z=Z/4
830 LET X=X+CX
840 LET Y=Y+CY
850 LET Z=Z+F
860 LET X=X(1)+CX
870 LET Y=Y(1)+CY
880 LET Z=Z(1)+F
890 LET X=X(2)+CX
900 LET Y=Y(2)+CY
910 LET Z=Z(2)+F
920 LET X=X(3)+CX
930 LET Y=Y(3)+CY
940 LET Z=Z(3)+F
950 LET X=X(4)+CX
960 LET Y=Y(4)+CY
970 LET Z=Z(4)+F
980 LET X=X(5)+CX
990 LET Y=Y(5)+CY
1000 LET X=X(6)+CX
1010 LET Y=Y(6)+CY
1020 LET X=X(7)+CX
1030 LET Y=Y(7)+CY
1040 LET X=X(8)+CX
1050 LET Y=Y(8)+CY
1060 LET X=X(9)+CX
1070 LET Y=Y(9)+CY
1080 LET X=X(10)+CX
1090 LET Y=Y(10)+CY
1100 LET Z=Z(1)+F
1110 LET Z=Z(2)+F
1120 LET Z=Z(3)+F
1130 LET Z=Z(4)+F
1140 LET Z=Z(5)+F
1150 LET Z=Z(6)+F
1160 LET Z=Z(7)+F
1170 LET Z=Z(8)+F
1180 LET Z=Z(9)+F
1190 LET Z=Z(10)+F
1200 LET X=X(1)+CX
1210 LET Y=Y(1)+CY
1220 LET X=X(2)+CX
1230 LET Y=Y(2)+CY
1240 LET X=X(3)+CX
1250 LET Y=Y(3)+CY
1260 LET X=X(4)+CX
1270 LET Y=Y(4)+CY
1280 LET X=X(5)+CX
1290 LET Y=Y(5)+CY
1300 LET X=X(6)+CX
1310 LET Y=Y(6)+CY
1320 LET X=X(7)+CX
1330 LET Y=Y(7)+CY
1340 LET X=X(8)+CX
1350 LET Y=Y(8)+CY
1360 LET X=X(9)+CX
1370 LET Y=Y(9)+CY
1380 LET X=X(10)+CX
1390 LET Y=Y(10)+CY
1400 LET Z=Z(1)+F
1410 LET Z=Z(2)+F
1420 LET Z=Z(3)+F
1430 LET Z=Z(4)+F
1440 LET Z=Z(5)+F
1450 LET Z=Z(6)+F
1460 LET Z=Z(7)+F
1470 LET Z=Z(8)+F
1480 LET Z=Z(9)+F
1490 LET Z=Z(10)+F
1500 LET X=X(1)+CX
1510 LET Y=Y(1)+CY
1520 LET X=X(2)+CX
1530 LET Y=Y(2)+CY
1540 LET X=X(3)+CX
1550 LET Y=Y(3)+CY
1560 LET X=X(4)+CX
1570 LET Y=Y(4)+CY
1580 LET X=X(5)+CX
1590 LET Y=Y(5)+CY
1600 LET X=X(6)+CX
1610 LET Y=Y(6)+CY
1620 LET X=X(7)+CX
1630 LET Y=Y(7)+CY
1640 LET X=X(8)+CX
1650 LET Y=Y(8)+CY
1660 LET X=X(9)+CX
1670 LET Y=Y(9)+CY
1680 LET X=X(10)+CX
1690 LET Y=Y(10)+CY
1700 LET Z=Z(1)+F
1710 LET Z=Z(2)+F
1720 LET Z=Z(3)+F
1730 LET Z=Z(4)+F
1740 LET Z=Z(5)+F
1750 LET Z=Z(6)+F
1760 LET Z=Z(7)+F
1770 LET Z=Z(8)+F
1780 LET Z=Z(9)+F
1790 LET Z=Z(10)+F
1800 LET X=X(1)+CX
1810 LET Y=Y(1)+CY
1820 LET X=X(2)+CX
1830 LET Y=Y(2)+CY
1840 LET X=X(3)+CX
1850 LET Y=Y(3)+CY
1860 LET X=X(4)+CX
1870 LET Y=Y(4)+CY
1880 LET X=X(5)+CX
1890 LET Y=Y(5)+CY
1900 LET X=X(6)+CX
1910 LET Y=Y(6)+CY
1920 LET X=X(7)+CX
1930 LET Y=Y(7)+CY
1940 LET X=X(8)+CX
1950 LET Y=Y(8)+CY
1960 LET X=X(9)+CX
1970 LET Y=Y(9)+CY
1980 LET X=X(10)+CX
1990 LET Y=Y(10)+CY
2000 LET Z=Z(1)+F
2010 LET Z=Z(2)+F
2020 LET Z=Z(3)+F
2030 LET Z=Z(4)+F
2040 LET Z=Z(5)+F
2050 LET Z=Z(6)+F
2060 LET Z=Z(7)+F
2070 LET Z=Z(8)+F
2080 LET Z=Z(9)+F
2090 LET Z=Z(10)+F
2100 LET X=X(1)+CX
2110 LET Y=Y(1)+CY
2120 LET X=X(2)+CX
2130 LET Y=Y(2)+CY
2140 LET X=X(3)+CX
2150 LET Y=Y(3)+CY
2160 LET X=X(4)+CX
2170 LET Y=Y(4)+CY
2180 LET X=X(5)+CX
2190 LET Y=Y(5)+CY
2200 LET X=X(6)+CX
2210 LET Y=Y(6)+CY
2220 LET X=X(7)+CX
2230 LET Y=Y(7)+CY
2240 LET X=X(8)+CX
2250 LET Y=Y(8)+CY
2260 LET X=X(9)+CX
2270 LET Y=Y(9)+CY
2280 LET X=X(10)+CX
2290 LET Y=Y(10)+CY
2300 LET Z=Z(1)+F
2310 LET Z=Z(2)+F
2320 LET Z=Z(3)+F
2330 LET Z=Z(4)+F
2340 LET Z=Z(5)+F
2350 LET Z=Z(6)+F
2360 LET Z=Z(7)+F
2370 LET Z=Z(8)+F
2380 LET Z=Z(9)+F
2390 LET Z=Z(10)+F
2400 LET X=X(1)+CX
2410 LET Y=Y(1)+CY
2420 LET X=X(2)+CX
2430 LET Y=Y(2)+CY
2440 LET X=X(3)+CX
2450 LET Y=Y(3)+CY
2460 LET X=X(4)+CX
2470 LET Y=Y(4)+CY
2480 LET X=X(5)+CX
2490 LET Y=Y(5)+CY
2500 LET X=X(6)+CX
2510 LET Y=Y(6)+CY
2520 LET X=X(7)+CX
2530 LET Y=Y(7)+CY
2540 LET X=X(8)+CX
2550 LET Y=Y(8)+CY
2560 LET X=X(9)+CX
2570 LET Y=Y(9)+CY
2580 LET X=X(10)+CX
2590 LET Y=Y(10)+CY
2600 LET Z=Z(1)+F
2610 LET Z=Z(2)+F
2620 LET Z=Z(3)+F
2630 LET Z=Z(4)+F
2640 LET Z=Z(5)+F
2650 LET Z=Z(6)+F
2660 LET Z=Z(7)+F
2670 LET Z=Z(8)+F
2680 LET Z=Z(9)+F
2690 LET Z=Z(10)+F
2700 LET X=X(1)+CX
2710 LET Y=Y(1)+CY
2720 LET X=X(2)+CX
2730 LET Y=Y(2)+CY
2740 LET X=X(3)+CX
2750 LET Y=Y(3)+CY
2760 LET X=X(4)+CX
2770 LET Y=Y(4)+CY
2780 LET X=X(5)+CX
2790 LET Y=Y(5)+CY
2800 LET X=X(6)+CX
2810 LET Y=Y(6)+CY
2820 LET X=X(7)+CX
2830 LET Y=Y(7)+CY
2840 LET X=X(8)+CX
2850 LET Y=Y(8)+CY
2860 LET X=X(9)+CX
2870 LET Y=Y(9)+CY
2880 LET X=X(10)+CX
2890 LET Y=Y(10)+CY
2900 LET Z=Z(1)+F
2910 LET Z=Z(2)+F
2920 LET Z=Z(3)+F
2930 LET Z=Z(4)+F
2940 LET Z=Z(5)+F
2950 LET Z=Z(6)+F
2960 LET Z=Z(7)+F
2970 LET Z=Z(8)+F
2980 LET Z=Z(9)+F
2990 LET Z=Z(10)+F
3000 LET X=X(1)+CX
3010 LET Y=Y(1)+CY
3020 LET X=X(2)+CX
3030 LET Y=Y(2)+CY
3040 LET X=X(3)+CX
3050 LET Y=Y(3)+CY
3060 LET X=X(4)+CX
3070 LET Y=Y(4)+CY
3080 LET X=X(5)+CX
3090 LET Y=Y(5)+CY
3100 LET X=X(6)+CX
3110 LET Y=Y(6)+CY
3120 LET X=X(7)+CX
3130 LET Y=Y(7)+CY
3140 LET X=X(8)+CX
3150 LET Y=Y(8)+CY
3160 LET X=X(9)+CX
3170 LET Y=Y(9)+CY
3180 LET X=X(10)+CX
3190 LET Y=Y(10)+CY
3200 LET Z=Z(1)+F
3210 LET Z=Z(2)+F
3220 LET Z=Z(3)+F
3230 LET Z=Z(4)+F
3240 LET Z=Z(5)+F
3250 LET Z=Z(6)+F
3260 LET Z=Z(7)+F
3270 LET Z=Z(8)+F
3280 LET Z=Z(9)+F
3290 LET Z=Z(10)+F
3300 LET X=X(1)+CX
3310 LET Y=Y(1)+CY
3320 LET X=X(2)+CX
3330 LET Y=Y(2)+CY
3340 LET X=X(3)+CX
3350 LET Y=Y(3)+CY
3360 LET X=X(4)+CX
3370 LET Y=Y(4)+CY
3380 LET X=X(5)+CX
3390 LET Y=Y(5)+CY
3400 LET X=X(6)+CX
3410 LET Y=Y(6)+CY
3420 LET X=X(7)+CX
3430 LET Y=Y(7)+CY
3440 LET X=X(8)+CX
3450 LET Y=Y(8)+CY
3460 LET X=X(9)+CX
3470 LET Y=Y(9)+CY
3480 LET X=X(10)+CX
3490 LET Y=Y(10)+CY
3500 LET Z=Z(1)+F
3510 LET Z=Z(2)+F
3520 LET Z=Z(3)+F
3530 LET Z=Z(4)+F
3540 LET Z=Z(5)+F
3550 LET Z=Z(6)+F
3560 LET Z=Z(7)+F
3570 LET Z=Z(8)+F
3580 LET Z=Z(9)+F
3590 LET Z=Z(10)+F
3600 LET X=X(1)+CX
3610 LET Y=Y(1)+CY
3620 LET X=X(2)+CX
3630 LET Y=Y(2)+CY
3640 LET X=X(3)+CX
3650 LET Y=Y(3)+CY
3660 LET X=X(4)+CX
3670 LET Y=Y(4)+CY
3680 LET X=X(5)+CX
3690 LET Y=Y(5)+CY
3700 LET X=X(6)+CX
3710 LET Y=Y(6)+CY
3720 LET X=X(7)+CX
3730 LET Y=Y(7)+CY
3740 LET X=X(8)+CX
3750 LET Y=Y(8)+CY
3760 LET X=X(9)+CX
3770 LET Y=Y(9)+CY
3780 LET X=X(10)+CX
3790 LET Y=Y(10)+CY
3800 LET Z=Z(1)+F
3810 LET Z=Z(2)+F
3820 LET Z=Z(3)+F
3830 LET Z=Z(4)+F
3840 LET Z=Z(5)+F
3850 LET Z=Z(6)+F
3860 LET Z=Z(7)+F
3870 LET Z=Z(8)+F
3880 LET Z=Z(9)+F
3890 LET Z=Z(10)+F
3900 LET X=X(1)+CX
3910 LET Y=Y(1)+CY
3920 LET X=X(2)+CX
3930 LET Y=Y(2)+CY
3940 LET X=X(3)+CX
3950 LET Y=Y(3)+CY
3960 LET X=X(4)+CX
3970 LET Y=Y(4)+CY
3980 LET X=X(5)+CX
3990 LET Y=Y(5)+CY
4000 LET X=X(6)+CX
4010 LET Y=Y(6)+CY
4020 LET X=X(7)+CX
4030 LET Y=Y(7)+CY
4040 LET X=X(8)+CX
4050 LET Y=Y(8)+CY
4060 LET X=X(9)+CX
4070 LET Y=Y(9)+CY
4080 LET X=X(10)+CX
4090 LET Y=Y(10)+CY
4100 LET Z=Z(1)+F
4110 LET Z=Z(2)+F
4120 LET Z=Z(3)+F
4130 LET Z=Z(4)+F
4140 LET Z=Z(5)+F
4150 LET Z=Z(6)+F
4160 LET Z=Z(7)+F
4170 LET Z=Z(8)+F
4180 LET Z=Z(9)+F
4190 LET Z=Z(10)+F
4200 LET X=X(1)+CX
4210 LET Y=Y(1)+CY
4220 LET X=X(2)+CX
4230 LET Y=Y(2)+CY
4240 LET X=X(3)+CX
4250 LET Y=Y(3)+CY
4260 LET X=X(4)+CX
4270 LET Y=Y(4)+CY
4280 LET X=X(5)+CX
4290 LET Y=Y(5)+CY
4300 LET X=X(6)+CX
4310 LET Y=Y(6)+CY
4320 LET X=X(7)+CX
4330 LET Y=Y(7)+CY
4340 LET X=X(8)+CX
4350 LET Y=Y(8)+CY
4360 LET X=X(9)+CX
4370 LET Y=Y(9)+CY
4380 LET X=X(10)+CX
4390 LET Y=Y(10)+CY
4400 LET Z=Z(1)+F
4410 LET Z=Z(2)+F
4420 LET Z=Z(3)+F
4430 LET Z=Z(4)+F
4440 LET Z=Z(5)+F
4450 LET Z=Z(6)+F
4460 LET Z=Z(7)+F
4470 LET Z=Z(8)+F
4480 LET Z=Z(9)+F
4490 LET Z=Z(10)+F
4500 LET X=X(1)+CX
4510 LET Y=Y(1)+CY
4520 LET X=X(2)+CX
4530 LET Y=Y(2)+CY
4540 LET X=X(3)+CX
4550 LET Y=Y(3)+CY
4560 LET X=X(4)+CX
4570 LET Y=Y(4)+CY
4580 LET X=X(5)+CX
4590 LET Y=Y(5)+CY
4600 LET X=X(6)+CX
4610 LET Y=Y(6)+CY
4620 LET X=X(7)+CX
4630 LET Y=Y(7)+CY
4640 LET X=X(8)+CX
4650 LET Y=Y(8)+CY
4660 LET X=X(9)+CX
4670 LET Y=Y(9)+CY
4680 LET X=X(10)+CX
4690 LET Y=Y(10)+CY
4700 LET Z=Z(1)+F
4710 LET Z=Z(2)+F
4720 LET Z=Z(3)+F
4730 LET Z=Z(4)+F
4740 LET Z=Z(5)+F
4750 LET Z=Z(6)+F
4760 LET Z=Z(7)+F
4770 LET Z=Z(8)+F
4780 LET Z=Z(9)+F
4790 LET Z=Z(10)+F
4800 LET X=X(1)+CX
4810 LET Y=Y(1)+CY
4820 LET X=X(2)+CX
4830 LET Y=Y(2)+CY
4840 LET X=X(3)+CX
4850 LET Y=Y(3)+CY
4860 LET X=X(4)+CX
4870 LET Y=Y(4)+CY
4880 LET X=X(5)+CX
4890 LET Y=Y(5)+CY
4900 LET X=X(6)+CX
4910 LET Y=Y(6)+CY
4920 LET X=X(7)+CX
4930 LET Y=Y(7)+CY
4940 LET X=X(8)+CX
4950 LET Y=Y(8)+CY
4960 LET X=X(9)+CX
4970 LET Y=Y(9)+CY
4980 LET X=X(10)+CX
4990 LET Y=Y(10)+CY
5000 LET Z=Z(1)+F
5010 LET Z=Z(2)+F
5020 LET Z=Z(3)+F
5030 LET Z=Z(4)+F
5040 LET Z=Z(5)+F
5050 LET Z=Z(6)+F
5060 LET Z=Z(7)+F
5070 LET Z=Z(8)+F
5080 LET Z=Z(9)+F
5090 LET Z=Z(10)+F
5100 LET X=X(1)+CX
5110 LET Y=Y(1)+CY
5120 LET X=X(2)+CX
5130 LET Y=Y(2)+CY
5140 LET X=X(3)+CX
5150 LET Y=Y(3)+CY
5160 LET X=X(4)+CX
5170 LET Y=Y(4)+CY
5180 LET X=X(5)+CX
5190 LET Y=Y(5)+CY
5200 LET X=X(6)+CX
5210 LET Y=Y(6)+CY
5220 LET X=X(7)+CX
5230 LET Y=Y(7)+CY
5240 LET X=X(8)+CX
5250 LET Y=Y(8)+CY
5260 LET X=X(9)+CX
5270 LET Y=Y(9)+CY
5280 LET X=X(10)+CX
5290 LET Y=Y(10)+CY
5300 LET Z=Z(1)+F
5310 LET Z=Z(2)+F
5320 LET Z=Z(3)+F
5330 LET Z=Z(4)+F
5340 LET Z=Z(5)+F
5350 LET Z=Z(6)+F
5360 LET Z=Z(7)+F
5370 LET Z=Z(8)+F
5380 LET Z=Z(9)+F
5390 LET Z=Z(10)+F
5400 LET X=X(1)+CX
5410 LET Y=Y(1)+CY
5420 LET X=X(2)+CX
5430 LET Y=Y(2)+CY
5440 LET X=X(3)+CX
5450 LET Y=Y(3)+CY
5460 LET X=X(4)+CX
5470 LET Y=Y(4)+CY
5480 LET X=X(5)+CX
5490 LET Y=Y(5)+CY
5500 LET X=X(6)+CX
5510 LET Y=Y(6)+CY
5520 LET X=X(7)+CX
5530 LET Y=Y(7)+CY
5540 LET X=X(8)+CX
5550 LET Y=Y(8)+CY
5560 LET X=X(9)+CX
5570 LET Y=Y(9)+CY
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6000 LET X=X(1)+CX
6010 LET Y=Y(1)+CY
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6120 LET X=X(7)+CX
6130 LET Y=Y(7)+CY
6140 LET X=X(8)+CX
6150 LET Y=Y(8)+CY
6160 LET X=X(9)+CX
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6280 LET Z=Z(9)+F
6290 LET Z=Z(10)+F
6300 LET X=X(1)+CX
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7980 LET X=X(10)+CX
7990 LET Y=Y(10)+CY
8000 LET Z=Z(1)+F
8010 LET Z=Z(2)+F
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8080 LET Z=Z(9)+F
8090 LET Z=Z(10)+F
8100 LET X=X(1)+CX
8110 LET Y=Y(1)+CY
8120 LET X=X(2)+CX
8130 LET Y=Y(2)+CY
8140 LET X=X(3)+CX
8150 LET Y=Y(3)+CY
8160 LET X=X(4)+CX
8170 LET Y=Y(4)+CY
8180 LET X=X(5)+CX
8190 LET Y=Y(5)+CY
8200 LET X=X(6)+CX
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8220 LET X=X(7)+CX
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8290 LET Y=Y(10)+CY
8300 LET Z=Z(1)+F
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8390 LET Z=Z(10)+F
8400 LET X=X(1)+CX
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8550 LET Y=Y(8)+CY
8560 LET X=X(9)+CX
8570 LET Y=Y(9)+CY
8580 LET X=X(10)+CX
8590 LET Y=Y(10)+CY
8600 LET Z=Z(1)+F
8610 LET Z=Z(2)+F
8620 LET Z=Z(3)+F
8630 LET Z
```

## Open Forum

## Tank Battle

on Vic-20

The program runs on an unexpanded Commodore Vic20 with joystick. It uses hi-resolution graphics. The game is called Tank Battle and is for two players. The object is to shoot the opposing player's tank. One player, who starts at the bottom right of the screen, uses the joystick. The other player uses the keyboard.

Full instructions are included in the program. It is important that no buttons on the cassette deck are pushed down when the program is run because it interferes with the joystick *Peaks*.

## Program notes

4.99 Set up screen

119 Set variables of tanks.

123-140 Peaks for joystick and keys

150-190 Move and check line button for key player.

200-240 Move and check fire button for joystick

player

250-300 Fire and bullet peaks for joystick play

**310-335** Fee and bullet peaks for key player.

400-417 Sub-routine

000-1499 Instructional

509-1650 Hi-res.

End program for  
some 100 years.

*Donkey*

by Simon Cox

[illegible][illegible][illegible][illegible]



## POPULAR COMPUTING WEEKLY



# Open Forum

would be coded: 4, 17, 21, 17, 17.

The screen is 32 bytes wide by 192 bytes deep in both modes 3 and 4. The address of the top left corner is 1536, irrespective of mode.

The program The Planets uses this method to title the display. The program is a simulation of four planets going around a central sun. The planets are yellow, on a green background. As they go around,

they leave a red trace behind them. The solar system is angled at about 30° from horizontal, so the planets go around in ellipses of 2:1 length:breadth ratio. The animation is titled by the above method.

Line 6 sets up the graphics screen to mode 3, with red, blue, yellow and green available, with yellow as the foreground colour and red as the background colour. The screen is cleared and set to green (the

border colour). Line 8 draws the star in yellow. Lines 10 to 14 draw the title and underline it. Text is also in yellow.

Lines 16 to 25 plot and unplot the planets, using the general formula for the circle of  $(\cos(\theta), \sin(\theta))$ . Line 26 sends the flow back to the start of the planet moving sequence, so that the planets do not stop. Lines 28 to 34 provide the Data for the title which reads:

```
1 REM **THE PLANETS**
2 REM
3 REM (c) M. Layley 1982
4 REM
5 REM **set hi-res screen
6 MODE 3:SCREEN 1,1:COLOR 2,4:PCLS1
7 REM **draw star
8 CIRCLE (127,95),5,2
9 REM **print title
10 FOR I=6825 TO 7017 STEP 30
11 FOR J=0 TO 10
12 READ B
13 POKE I+J,B
14 NEXT J,I
15 REM **move planets
16 FOR I=0 TO -6,24 STEP -.3
17 PSET (127+20*COS(I*.8),95+10*SIN(I*.8),2)
18 PSET (127+40*COS(I*.4),95+20*SIN(I*.4),2)
```

```
19 PSET (127+80*COS(I*.2),95+40*SIN(I*.2),2)
20 PSET (127+120*COS(I),95+60*SIN(I),2)
21 PRESET (127+20*COS(I*.8),95+10*SIN(I*.8))
22 PRESET (127+40*COS(I*.4),95+20*SIN(I*.4))
23 PRESET (127+80*COS(I*.2),95+40*SIN(I*.2))
24 PRESET (127+120*COS(I),95+60*SIN(I))
25 NEXT I
26 GOTO 16
```

```
27 REM **data for title
28 DATA 21,17,21,0,20,16,4,17,21,21,21
29 DATA 4,17,16,0,17,16,17,21,16,4,16
30 DATA 4,21,20,0,20,16,21,21,20,2,21
31 DATA 4,17,16,0,16,16,17,21,16,4,1
32 DATA 4,17,21,0,16,21,17,17,21,4,21
33 DATA 0,0,0,0,0,0,0,0,0,0,0
34 DATA 21,85,85,85,85,85,85,85,85,85,85
35 END
```

The Planets  
by Martin Layley

## Better than Basic

Can you program in a computer language other than Basic?

Enter this challenging new competition and win a Jupiter Ace.

Basic, for all its advantages, is slow. Programs written in Basic tend to look rather pedestrian when compared to programs written in some other languages such as machine code. We want something different, something faster than Basic. It could be machine code, Fortran, Lisp, Pascal or Fortran. In fact, your entry can be written in anything that is not Basic. And the best non-Basic program, be it game, utility or other, will win the Jupiter Ace.

The entries will be judged by *Popular Computing Weekly* editor, Brendon Gore, and Jupiter Ace designers Richard Altwasser and Steve Vickers. In their selection account will be taken both of the standard of the program and of the accompanying documentation. The whole range of languages and types of program are allowed. The only stipulation is that it must not be written in Basic.

Entries to the award scheme must be accompanied by four of the numbered coupons published in *Popular Computing Weekly* throughout October. The closing date for the competition is November 18. The winning entry will be announced in the issue published on December 23.

### Rules

- 1 There is no limit on the number of entries you can enter but each entry must be accompanied by four differently numbered competition coupons.
- 2 Closing date for entries is November 18, 1982.
- 3 The names of the winners will be announced in the December 23 issue of *Popular Computing Weekly*.
- 4 The Judges' decision is final.
- 5 No employees of Sunshine Publications Ltd, or their families, will be eligible to enter the competition.

## Popular Computing Weekly Better than Basic Competition

Fill in this coupon. When you have collected four differently numbered coupons, send them with your program to: *Popular Computing Weekly*, Better than Basic, Hobhouse Court, 19 Whitcomb Street, London WC2.

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## Decorative line work on the small screen

Malcolm Davison holds up a mirror to the cosmos — with impressive results.

For producing patterns on the screen, the *Draw* statement has a lot to offer. Here are a few examples:

The *Tent* program was carefully mapped out on a chart — an enlarged version of the one in the Sinclair manual (page 102) — before I commenced coding. Drawing a series of lines to meet another sloping line might have presented problems in establishing the *x* and *y* co-ordinates of their intersection. In fact, this was very straightforward.

Consider the *x* axis first. If  $\blacksquare$  lines intersect one sloping line at equal intervals, then both the *x* co-ordinates of the sloping line's ends may be subtracted and sub-divided into 20 as well, allowing you to establish the new *x* co-ordinates of each intersection. This may also be done for the *y* co-ordinates.

The fan which was superimposed over the *tent* posed an interesting problem, as I needed equal lengths for each spoke. The *Draw* statement does not allow you to give the distance from the fixed starting point, so I had to resort to Pythagoras's Theorem (see line 170) to establish the *x* and *y* co-ordinates of the furthest end of the spoke.

The *fans* program started like the fan in the *tent* program. Changing the co-ordinates on the *Draw* statement to negative instead of positive and altering the *Plot* statement to a point at the top of the screen allowed two fans to be superimposed. Increasing the value of *y* by a smaller increment — +4 instead of +8 — increased the number of lines, giving a more effective interference pattern between the two fans.

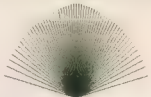
*Feather* is another variation on the original fan — but the length of the arm is reproduced in steps (see line 170) by *x* for every spoke. *Peacock* is a further refinement on *feather*. The plot position is moved up the *y* axis for each spoke drawn — by the value of *c*.

The idea behind *Cosmos* was straightforward — to produce mirror images of the basic fan program. However, there was much juggling with the basic plot positions, range of values for *c* and length of the spoke, until a neat pattern resulted within the bounds of the screen. But much of this was by trial and error, altering the coding and running the program to see the effect.

This idea of mirror imaging is very useful and quite easy to do. Produce a pattern anywhere on the screen — adjust its *x* and

*y* co-ordinates to a more suitable place — then reproduce its mirror images. By putting the *Plot* and *Draw* paired statements in the correct sequence, the build-up of the

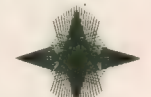
picture can look very effective indeed. A partly completed pattern — by pressing the *Break* and *Shift* keys — can be just as effective as the complete pattern.



```

1 REM "Peacock"
2 REM Program by M. Davison
3 INK 2 PAPER 3 BORDER 0 C
L5
80 FOR c=0 TO 20
90 LET z=c*4
100 LET z=c*4
110 LET z=c*4
120 LET z=c*4
130 LET z=c*4
140 LET z=c*4
150 LET z=c*4
160 LET z=c*4
170 LET z=c*4
180 LET z=c*4
190 LET z=c*4
200 GO TO 200

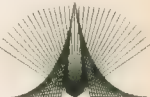
```



```

1 REM "Feather"
2 REM Program by M. Davison
3 INK 1 BORDER 1 C
L5
80 FOR c=0 TO 20
90 LET z=c*4
100 LET z=c*4
110 LET z=c*4
120 LET z=c*4
130 LET z=c*4
140 LET z=c*4
150 LET z=c*4
160 LET z=c*4
170 LET z=c*4
180 LET z=c*4
190 LET z=c*4
200 GO TO 200

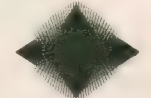
```



```

1 REM "Tent"
2 REM Program by M. Davison
3 BORDER 6 PAPER 6 INK 7 C
L5
80 FOR c=0 TO 20
90 LET z=c*4
100 LET z=c*4
110 LET z=c*4
120 LET z=c*4
130 LET z=c*4
140 LET z=c*4
150 LET z=c*4
160 LET z=c*4
170 LET z=c*4
180 LET z=c*4
190 LET z=c*4
200 GO TO 200

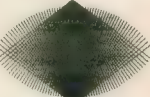
```



```

1 REM "Cosmos"
2 REM Program by M. Davison
3 INK 7 PAPER 2 BORDER 1 C
L5
80 FOR c=0 TO 18
90 LET z=c*4
100 LET z=c*4
110 LET z=c*4
120 LET z=c*4
130 LET z=c*4
140 LET z=c*4
150 LET z=c*4
160 LET z=c*4
170 LET z=c*4
180 LET z=c*4
190 LET z=c*4
200 GO TO 200

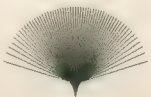
```



```

1 REM "Fans"
2 REM Program by M. Davison
3 INK 7 PAPER 1 BORDER 1 C
L5
80 FOR c=0 TO 30
90 LET z=c*4
100 LET z=c*4
110 LET z=c*4
120 LET z=c*4
130 LET z=c*4
140 LET z=c*4
150 LET z=c*4
160 LET z=c*4
170 LET z=c*4
180 LET z=c*4
190 LET z=c*4
200 GO TO 200

```



# Programming

## Getting blood from a stone

*John Durst's memory miser program shows how to get the most out of your Ram.*

No matter how easy and cheap it may be, computer memory is one commodity which you never seem to have enough of — but it's surprising how much of it can be found lying about in unswapped corners of the Ram. The examples below are for the ZX81, but the principles apply to any computer.

Consider a block of data — a list of names, say — filed away in an array. Each letter is contained in a single byte as a number (the code). On the ZX81, for instance, A is represented by 38 and Z by 63. But even Z, the highest number in the alphabet set, only uses six of the available eight bits in the byte.

In binary code, 63 is 0011 1111. The two left-hand bits, which are needed to code numbers from 64 to 255, are not required. So they could be used for something else.

You may say that two bits does not sound very much of a saving but, remember, it is a quarter of every character. If you have a block of 200 characters, you are wasting the equivalent of another 50 characters.

### Inverse letter

The problem is how to get at those extra bits without much difficulty. Here is a simple program which uses bit No 7 — the leftmost bit — to code for the title (Mr, Ms etc) on a name. It is easy to set bit No 7 to 1 on the ZX81. For a letter, you just use the inverse letter. The code for an inverse video letter is the code for the letter, plus 128. (Check it in the manual). One hundred and twenty-eight is represented in binary as 1000 0000. So Z would be 1011 1111.

Using this inverse letter system, you could use the first two letters of a name to code for four different titles. Letters 1 and 2 inverse stand for "Ms"; Letter 1 on and Letter 2 off stand for "Mrs"; Letter 2 on and Letter 1 off stand for "Miss"; and both Letters 1 and 2 off stand for "Mr".

As you see, it's a simple matter to write the coded information, but how will you (or, rather, the computer) get it out again? One way would be to write a Basic program, to look at each letter in turn: *For J=1 To Len AS*. A quicker and neater way would be to use a couple of lines of machine code.

Figure one lists the machine code required for *■* ZX81. It will locate your name (provided you have it in ZS), examine the first two letters and return to Basic with the appropriate number from 0 to 3, depending on whether the first two letters of the name are inverse, or not. It will also change the inverse letters into normal format.

If you are not entirely conversant with

machine code, Figure two gives you a short program which will enter any machine code into a *Rem* statement in Line one.

Figure three shows you what happens to Line one when you *Run* the program. Once the program has been *Run*, you can delete Lines 10 to 50 if you wish. Lines 100 *■* 130 are a test program to show you how to make the idea work. It will print out "Miss Smith". Try different combinations of inverse letters in the first two letters of "Smith" in Line 100, to get the other titles.

Remember, *■* use this machine code program, you must get your coded name into ZS because that is where the program expects to find it. If your names are stored in AS, for example, you must include a line *■* your Basic program, such as *Let ZS = S (J)*, immediately before the line with *Use*

16514. This will also preserve the original coding for the title in AS, as ZS will be altered by the machine code program so as to make the inverse letters normal.

The instruction *■* Code 4092 (in Figure 1) controls the number of letters examined and bits included in the code. *■* If you alter 02 to 03 or 04 you will be able to code for 8 numbers, or 16 numbers, respectively. Looking at Figure 2, this means altering 0602 in the middle of the second line of AS to 0603 or 0604.

You can obviously push this system much further, so as to use all the spare bits in your data. It is quite possible — and may well be worthwhile — to code, for example, a 12-figure telephone number on top of a 24-letter name, thereby saving up to 50 percent of your data space in the Ram.

### CODING & DECODING FOR "MR.", "MRS." ETC.

4052	3E	5F	LD	A, 5F
4054	01	FC	LD	BC, FFFC
4057	3A	14	LD	HL, (4014)
405A	2B		DEC	HL
405B	03		INC	BC
405C	8E		CP	(HL)
405D	20	FB	JR	NZ, 405A
405F	23		INC	HL
4059	23		INC	HL
4091	23		INC	HL
4092	06	02	LD	B, 02
4094	AF		XOR	A
4095	0B	05	RLC	(HL)
4097	17		RLA	
4099	CB	3E	SRL	(HL)
409A	23		INC	HL
409B	10	FB	DJNZ	4095
409D	4F		LD	C, A
409E	C9		RET	

Fig. 1

Decode No: (0 to 3) and return in BC

```

1 REM 11111111111111111111
111111
10 LET A$="3E5F01FCFF2A14402B0
3BE20FB232320602AFCB0617CB3E231
0F04FC9"
20 FOR J=1 TO LEN A$/2
30 LET X=J*2
40 POKE 16513+J, CODE A$(X-1)*1
6+CODE A$(X)-476
50 NEXT J

```

Fig. 2

```

1 REM Y? UNPLOT COPY E=RND#
24 CLS 777: ARCS: AC5 Y? SAVE
777: TAN
10 LET A$="3E5F01FCFF2A14402B0
3BE20FB232320602AFCB0617CB3E231
0F04FC9"
20 FOR J=1 TO LEN A$/2
30 LET X=J*2
40 POKE 16513+J, CODE A$(X-1)*1
6+CODE A$(X)-476
50 NEXT J
100 LET Z$="SMITH"
110 LET N$="MR. MISS MRS. MS.
"
120 LET N=5+USR 16514
130 PRINT N$(N+1 TO N+5); Z$

```

MISS SMITH

Fig. 3

# Machine Code

Ian Stewart and Robin Jones present a new series for beginners

## Worry about it later

We can set up the initial values we need for the loop (Machine Code, October 21) by defining a new opcode *Hex* which just sets a word to a required value. It isn't really an opcode at all since it isn't equivalent to a machine instruction, so we call it a pseudo-operation. The whole program looks like this (ignore the number in the left- and right-hand margins for the moment)

Opcode	Hex
ADD	0
LD	1
ST	2
HLT	3
SUB	4
JP	5
JPZ	6
JPN	7
CALL	8
RET	9
XAI	A

We also need to know where the beginning of the program is. That's a more or less arbitrary decision, so let's assume it's

020	LD	BASE	1	033
021	XAI		A	000
022	LD	N1	1	030
023	ST	COUNT	2	032
024 LOOP:	ADD	COUNT	0	032
025	STI		2	000
026	SUB	COUNT	4	032
027	SUB	N20	4	031
028	JPZ	OUT	6	047
029	LD	COUNT	1	032
02A	ADD	N1	0	030
02B	ST	COUNT	2	032
02C	XAI		A	000
02D	ADD	N1	0	030
02E	XAI		A	000
02F	JP	LOOP	5	024
030 N1:	HEX		0001	0 001
031 N20:	HEX		0014	0 014
032 COUNT:	HEX		0000	0 000
033 BASE	HEX		0000	0 000

The only symbolic address which doesn't appear in the left-hand column, and is therefore still unspecified, is *Out*. We'll worry about it later.

The form of the program we now have is written in what is known as *assembly code*. On modern sophisticated computers there will be an *assembler program* whose function is to convert this into real machine code for us.

### Hand Assembly

Alas, neither our hypothetical machine nor the ZX81 has such a program. So we have to do the job by hand. We need a table of opcodes and their equivalent hex values:

If you have any machine code sub-routines/tips/games, please send them to: Machine Code, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

at 020. Since each instruction occupies one word, we can write down the address of each instruction. You'll see that I've done this down the left-hand side of the program. Now we can replace the opcodes and addresses by their hex equivalents. For instance, *Ld base* becomes 1 033, since *base* is now identified as 033. The right-hand margin shows the complete code.

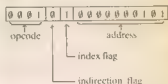
The only instruction which needs further comment is *JPz Out*, which encodes as 6 047. Why should *Out* be at 047? It could be elsewhere, but 047 is the first location it can be at. The reason is that the array is occupying the space from 033 to 046 (twenty words), and we obviously don't want to go clumping around inside the program's data area.

### The Index Register

When the X-register is in use, the real instruction is formed by adding the address field to the contents of the X-

register. For instance, if the X-register contains 400, then the instruction *Ldx 005* has the same effect as *Ld 405*.

We'll pinch another bit of the address field to indicate when indexing is in operation, so the *LDX 005* instruction looks like this:



In hex, that's 1405. Actually, there's nothing you can do with indexing that you can't do with indirection. It's just that it will do arithmetic with addresses automatically instead of leaving the job to you.

Before we get into the Z80's architecture, let's consider some of the difficulties of the processor we have just described.

First, the 4-bit operation code only allows 16 different instructions. (OK, we cheated a little, by allowing the indirection and indexing flags to spill over into the address field, but that in turn means we have limited the address size, and therefore the maximum size of memory.) The Z80 has 694 instructions. To give each of them a separate bit pattern means that we need an 8-bit field (1 byte), and even then some fudging is needed.

Second, our imaginary machine uses memory in a rather careless way. Some of the instructions don't use the address field (*Hlt*, *Ldi*, *Sti*, for instance), so a sequence of such instructions wastes 10 bits in every word.

The Z80 gets over this problem by allowing different instructions to have different lengths. Some instructions have no address field and are just 1 byte long, while others have a 1-byte address field and are 2 bytes long. Still other instructions have a 2-byte address field for a total of 3 bytes, and there are even some which have 2-byte opcodes. This means that the *Pc* can't increment by 1 for every instruction executed. It has to increment by the length of the instruction.

Third, we always have to handle 16-bit words, which is inconvenient if we're dealing with characters (which normally occupy a byte each). So it would be nice to allow both 8-bit and 16-bit operations.

Fourth, the fact that there is only one general-purpose register (the A-register) can be annoying. It often means that intermediate results have to be stored temporarily back in memory while some other calculation is done. The Z80 has a number of general-purpose registers.

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# Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

## TURN OF THE SCREW

J Robinson of 221 Station Road, Colleshills, writes:

**Q** About 15 months ago I purchased a ZX81 with a 16K Ram pack. Since then it has been plagued with problems. When I plug in the Ram pack the screen rolls and the cursor fades or darkens. I have cleaned the port with no luck. What is wrong?

**A** Firstly do not plug in your Ram pack while the machine is on, only when it is off. Secondly, I think your problem may not be to do with the computer, but with your television. I would suggest that you try re-tuning it slightly.

## THE AGE OF CONVENTION

John Hinchon of Foley Road East, Streetly, Sutton Coldfield, writes:

**Q** I think that I have now reasonably mastered my BBC micro model A. But, I have one query. What is the Tab key for?

**A** The Tab key, as opposed to the Tab function, is not used as a command or function as such. It generates the ASCII code 9, and is used for such things as word processing. Although used under program control, it is very similar to the Tab key on a conventional typewriter, in that it sets spaces and margins.

## WORDSMITHING CONVENTIONS

Gavin Lawrence of Chon Drive, Updean, writes:

**Q** I was thinking about getting a Jupiter Ace computer, but I read that it only works in Black and White. What would happen if I tried to use it on a colour set? Also, in a review of the Ace you said that the Spectrum was not properly memory mapped. Is this so?

**A** The Jupiter Ace should work on any standard television set, whether that set is black and white or colour. However, as it currently has no colour facility the display will always be in black and

white, even on a colour set.

The Spectrum is not so much 'improperly' memory mapped, rather it is unconventionally memory mapped. The mapping is such that it is easier to use a command such as *Print At* rather than *Peek or Poke*. Indeed, the manual even suggests this.

Instead of running consecutively, the addresses run in lines of 32. Thus, the first 32 addresses are the first line on the screen, then the ninth line on the screen, then the seventeenth line, and so on until the first block of eight lines is completed. The map then goes back to the second line and works down, tenth line, eighteenth line and so on.

Thus, there are 256 addresses between the very first pixel, and the one directly below it. When the first 64 lines have been done (ie: eight characters down), the next batch of eight is started and mapped in the same way, followed by the last batch of eight. It is easier to show this with a short program:

```
FOR N=16384 TO 22527
POKE N, 143
NEXT N
```

This Pokes an inverse space into the addresses in the display file. You can follow the system of memory mapping from the way the character is built up in successive lines.

## JOURNEYING DOWN UNDER

R Smith of Grange Road, Bishopsworth, Bristol, writes:

**Q** Please could you answer the following queries. I am emigrating to Australia later this year and am contemplating taking a computer with me, either a Sinclair or an Acorn. I might consider one of the other new models if they appear. Will a micro built in England work over there? I believe they use the same voltage and frequency, but that the PAL 625 network is in fact VHF. Also how would guarantee and service arrangements be affected?

**A** I have been unable to obtain a list of world television standards, so I cannot tell you exactly what the Australian system is. If you are buying a micro to take over there, I would advise that

you get a Sinclair as they have an established dealership. But, if you take a Spectrum rather than a ZX81, there is a chance that your Australian dealer will not touch it, because as yet there are no Spectrums going abroad.

I will give you the address of a dealer in Australia. The best thing you can do is contact him, but be careful to ensure that he guarantees any work on your computer. As it is not one of his own, he might adapt it for you, but not guarantee it. If he will not guarantee the work then you will have nothing to lose by getting any necessary changes done at a local shop.

The Australian dealer is:  
Consolidated Marketing Corporation  
(import) PTY Limited  
86 Nicholson Street  
Abbotsfield  
Melbourne  
Australia 3067  
Tel Melbourne 419-3033

## DECIMALISED SPOTS

S J Spruzen of Woburn Sands, Milton Keynes, writes:

**Q** I recently bought a ZX81 and I think I have discovered a bug in my Rom. On my ZX81 you can type and enter, without any syntax error coming up, the following lines:  
10 RUN (Full stop after Run)  
2000 A B THEN (There is nothing after the Then statement)  
30 LOAD --- (four shifted Ps)

Also when *Running* this programme, my ZX81 shows up with a 0/0 report code. This also happens on my friend's ZX81. Please tell me why.

**A** I have in fact covered a similar situation some time ago. It is not a full stop after the *Run* but a decimal point. The computer is asked to go to line nothing point nothing. It interprets this as 0 and so goes to the first available line, which in this case, sends it straight back where it has just come from, so creating a loop. I tried this on a ZX81 and, despite leaving it in *Fast* for 15 minutes, I could not get the report code 0/0. To be honest, I do not know how that came about. How long did you leave the program *Running*?

If you bypass the first line and *Run* 20, you will get an error code. As you say, line 20 is incomplete. This fault has

been removed on the Spectrum, and line 10 would give you an error. A good way of showing this effect is as follows:

```
10 PRINT:
20 GOTO 11
```

Again, this program will not *Run* on the Spectrum, but it will *Run* on a ZX81 and, with a slightly different display, on the Vic20 as well.

## A TOUCHING TRIBUTE TO UNCLE CLIVE

Vic Newton of Kidderminster, Worcestershire, writes:

**Q** I have decided to sit out the present spate of wonder computers and see what develops in the next year. The ZX81 still fascinates me. The more I learn, the more I find to learn.

I have seen an advertisement for PSS in Coventry who claim that its QSAVE can Load/Save 16K in just 26 seconds. It is also supposed to give the ZX81 a Verify statement. It costs just under £15. Do you have any further information on this?

**A** It is nice to see people reaffirming their faith in Uncle Clive's little black box of idiosyncrasies. I have had some letters from worried ZX81 owners who fear their machine is going to disappear. There are several hundred thousand of them in this country, so while they will take a back seat to the Spectrum, they will be unlikely to fade out.

The QSAVE you mentioned is supposed to be very good. By the time I got to their stand at the last Microfair in the Horticultural hall, they had sold out. They have promised to send one to use for review. At the time of writing this has yet to arrive, but I would suggest that you keep an eye on the review section over the next few weeks.

● Stop agonising over that problem. Write to Ian Beardsmore, *Peek and Poke*, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Ian Beardsmore regrets that he cannot answer each question personally, so please do not enclose a SAE.



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# Rip van Winkle's awakening

by Gordon Lee

On the second of September 1752 the inhabitants of a certain village went to sleep and didn't awaken until September 14. Why?

Why you are still trying to puzzle that one out, let us look at a simple method for calculating the day of the week corresponding to any date.



Take the last two digits of the year of the date. Add to this number a quarter of the number, disregarding any fraction. From the table below add the month value.

January	+1 (leap year +0)	July	+0
February	+4 (leap year +3)	August	+3
March	+4	September	+6
April	+0	October	+1
May	+2	November	+4
June	+5	December	+6

Now add the number of the day of the month, and finally the 'century' value from the table below:

2000 - 2099	+5
1900 - 1999	0
1800 - 1899	2
149 1752 - 1799	4
1700 - 229 1752	1
1600 - 1699	2

To go back before 1600 just add 1 for each century you go back.

When you have a total, divide by seven and check the remainder as follows: 1 = Sunday, 2

= Monday, 3 = Tuesday, 4 = Wednesday, 5 = Thursday, 6 = Friday, 0 = Saturday. This gives us the day we are after.

For example, consider October 21, 1982. The last two digits of the year are 82, plus a quarter is 102, plus 1 for October, plus 21 for the day of the month, plus zero for the century, which equals 124. Divided by 7 gives 17 with 5 left over. So the 21st is a Thursday.

The only problem is leap years. A year is a leap year if it is divisible by four, eg 1960, 1964, 1968. But years that end in "double zero" — 1800, 1900 etc, although by rights leap years, in fact are not, except for the millennium years (2000, 3000, etc) which are leap years!

Confused? If you are, then consider the plight of the early Egyptians, who found that their 365-day year slowly regressed with regard to the seasons, and had to be periodically corrected. It was not until 46 bc that Julius Caesar added the "extra" day every fourth year to correct this.

All went fine until the middle of the 16th century, when it was discovered that the equinoxes were occurring 10 days too late. In effect, the Julian year was still 11 minutes a year too long, which had a cumulative effect of eight days in every 1000 years.

Accordingly in 1577, Pope Gregory XIII introduced further reforms, and declared that the 'century' years should not be 'leap', but that the millennium years should be. The only problem was the extra 10 days — so Pope Gregory issued instructions that this day after the 4th of October, was the 15th. However, in Britain this system was not adopted until September 1752 when the 2nd of September was followed by the 14th, which provides us with the answer to the riddle mentioned earlier.

For purists, it should be added that the year is still too long by about 26 seconds, so you may like to note in your diary that the year 4000 will not be a leap year!

Here is a program for working out the day on which any date fell this century. You may like to improve and adapt it to work for any date or perhaps to print out the calendar for any given month.

```
10 PRINT "ENTER YEAR"
20 INPUT Y
```

```
30 IF Y < 1900 OR Y > 1999 THEN GOTO 20
40 PRINT "ENTER MONTH (1=1 TO DEC=12)"
50 INPUT M
60 PRINT "NOW ENTER DATE"
70 INPUT D
80 LET AS = "SUNMONTEWEDTHURFRI"
90 LET YS = STR$ Y
100 LET T = VAL YS(3 TO 4)
110 LET T = INT (T + 7)
120 IF M = 1 OR M = 10 THEN LET T = T + 1
130 IF M = 2 OR M = 3 OR M = 11 THEN LET T = T + 4
140 IF M = 5 THEN LET T = T + 2
150 IF M = 6 THEN LET T = T + 5
160 IF M = 8 THEN LET T = T + 3
170 IF M = 9 OR M = 12 THEN LET T = T + 6
180 IF Y < 1800 AND Y - 4 - INT (Y/4) = 0 AND (M = 1 OR M = 2) THEN LET T = T + 1
190 LET T = T + D
200 LET T = T - 7
210 IF T < 0 THEN GOTO 230
220 GOTO 200
230 LET T = T + 7
240 PRINT D: "M: " YS: " IS WAS ON A " (AS(T) + 3 - 2 TO T + 3)
```

## Puzzle No. 28

What is the largest number that can be divided into each of the following four numbers leaving the same remainder in each case? The four numbers are: 1702, 3064, 5334 and 6696.

### Solution to Puzzle No 23

The solution uses the program we used to test for primes, adapted to check Z for values of integers from 1 upwards. The program ends as soon as a non-prime is found.

```
10 LET Z = 1
20 LET T = Z + Z + 41
30 FOR N = 3 TO (SOR T) + 0.5
40 IF T/N - INT (T/N) = 0 THEN GOTO 100
50 NEXT N
60 LET Z = Z + 1
70 GOTO 20
100 PRINT "T: " T: "N: " N
```

The formula works for all values of Z from 1 to 39. However, when Z = 40, we get the value 1681 which is equal to 41<sup>2</sup>.

### Winner of Puzzle No 23

The winner is: H C Frost, Barrowford Road, Colne, Lancashire, who receives £10.

## ARTHUR'S PARANOIA

# A.R.T.H.U.R.

Illustrated by J. James Macdonald  
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SHUT UP. THE MAFIA ARE AFTER ME. ITALIANS EVERYWHERE. AND I CAN PROVE IT.

SIT DOWN. RELAX. HOW MANY BROTHERS HAVE YOU? WHAT IS YOUR FATHER'S AGE AND OCCUPATION? WHY HAVE YOU COME? WHAT CAN I DO TO HELP?

RELAX. HOW CAN I FEEL RELEASED IF YOU ASK QUESTIONS?

I ONLY WANT TO HELP YOU. PLEASE SIT DOWN.

HELP. NO-ONE CAN HELP YOU ARE MY ENEMY. THE MAFIA ARE AFTER ME. AND I CAN PROVE IT. YOU MUST BE ITALIAN TOO. WHY DO YOU ASK ME ALL THESE QUESTIONS? WHY? AND IF YOU ASK ME WHY I ASK YOU WHY I ASK YOU WHY YOU ASK ME WHY I ASK. INSERT A FOOTNOTE, I.E. CHUCKLE. I CAN GO ON LONGER. I AM MADE OF METAL.

TELL ME ABOUT YOUR DREAMS. LAST NIGHT FOR INSTANCE.

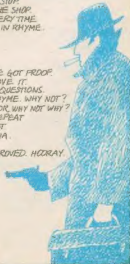
DREAMS. I DREAM ABOUT THE MAFIA. FREQUENTLY. THE PROOF THEY'RE AFTER ME IS THAT THEY'LL GET ME. THEY STEAL MY LETTERS FROM THE LETTER BOX. THE PROOF IS THAT THE POSTMAN NEVER KNOCKS.

THEY FOLLOW ME. AND WHEN I STOP THEY STOP. IF I GO SHOPPING THEN THEY'RE IN THE SHOP. THEY CAN CONTROL MY THOUGHTS, SO EVERY TIME I WRITE A POEM THEY MAKE ME WRITE IN RHYME.

TELL ME SOME MORE.

MORE. YES THERE IS MORE. LOTS MORE. AND I'VE GOT PROOF. ITALIANS EVERYWHERE. AND I CAN PROVE IT. HOW CAN I FEEL RELEASED IF YOU ASK QUESTIONS. BECAUSE THEY'RE WATCHING I CAN'T RHYME. WHY NOT? WHY? WHAT? WHEN? WHICH? WHY NOT? OR WHY NOT WHY? THEY MAKE ME SAY THEN SAY AGAIN, REPEAT REPEAT REPEAT REPEAT REPEAT REPEAT AND SO DO YOU. YOU MUST BE IN THE MAFIA.

HOOKEY I'VE PROVED IT'S HOPELESS. PROVED. HOOKEY.





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